DECEMBER 1959

Utility engineering section begins on page 39

Electrical South

...ERN MAGAZINE OF ELECTRICAL CONSTRUCTION
...ing the 18 Southern and Southwestern States

A complete section on time saving tools and methods

University Microfilms
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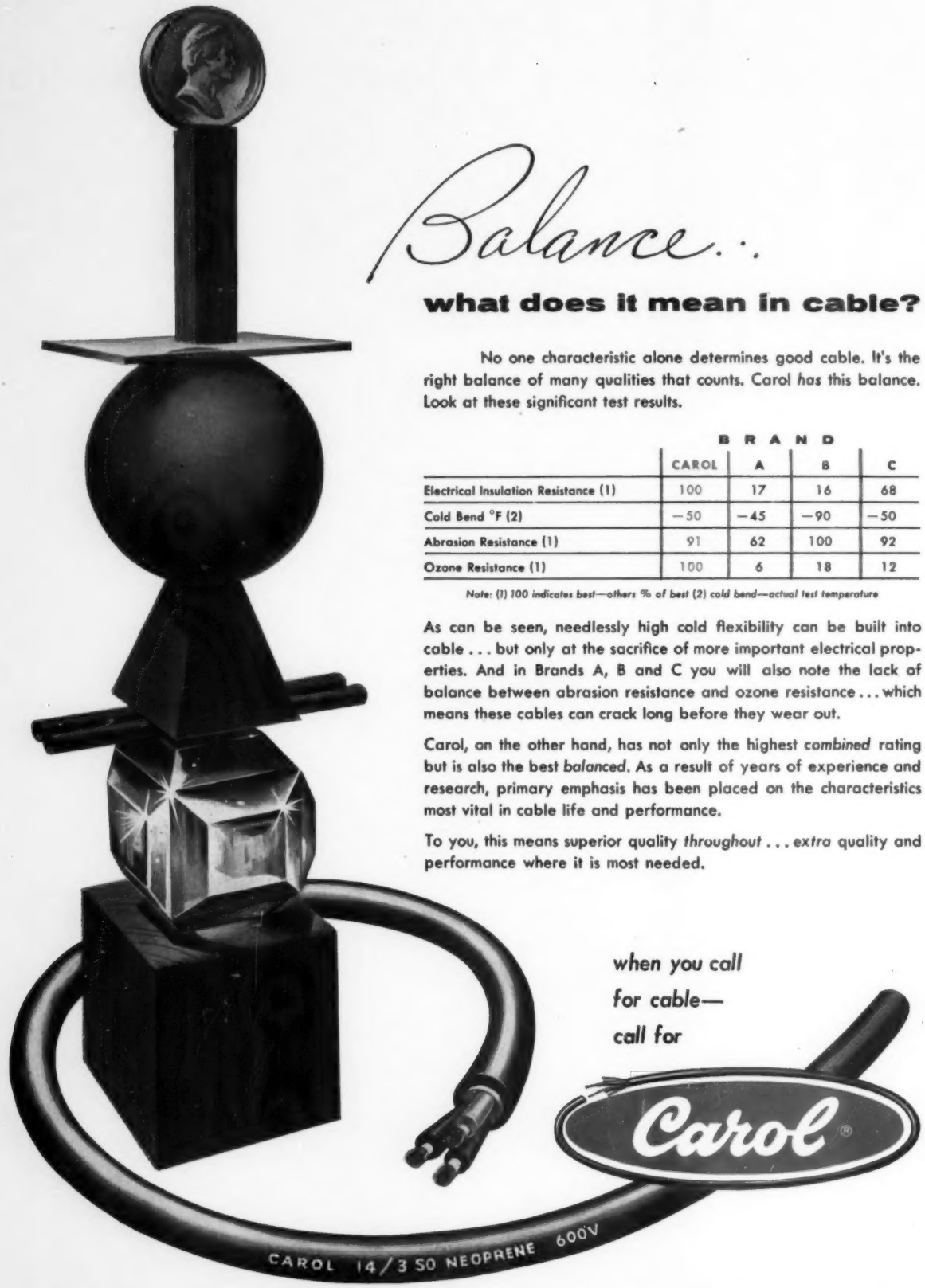
Ann Arbor Mich 4



Balance...

what does it mean in cable?

No one characteristic alone determines good cable. It's the right balance of many qualities that counts. Carol *has* this balance. Look at these significant test results.

	BRAND			
	CAROL	A	B	C
Electrical Insulation Resistance (1)	100	17	16	68
Cold Bend °F (2)	−50	−45	−90	−50
Abrasion Resistance (1)	91	62	100	92
Ozone Resistance (1)	100	6	18	12

Note: (1) 100 indicates best—others % of best (2) cold bend—actual test temperature

As can be seen, needlessly high cold flexibility can be built into cable . . . but only at the sacrifice of more important electrical properties. And in Brands A, B and C you will also note the lack of balance between abrasion resistance and ozone resistance . . . which means these cables can crack long before they wear out.

Carol, on the other hand, has not only the highest *combined* rating but is also the best *balanced*. As a result of years of experience and research, primary emphasis has been placed on the characteristics most vital in cable life and performance.

To you, this means superior quality *throughout* . . . *extra* quality and performance where it is most needed.

when you call for cable— call for

Carol®

PORTABLE CORDS • POWER SUPPLY CABLE • CONTROL CABLES • WELDING CABLE • GOVERNMENT TYPES • CORD SETS

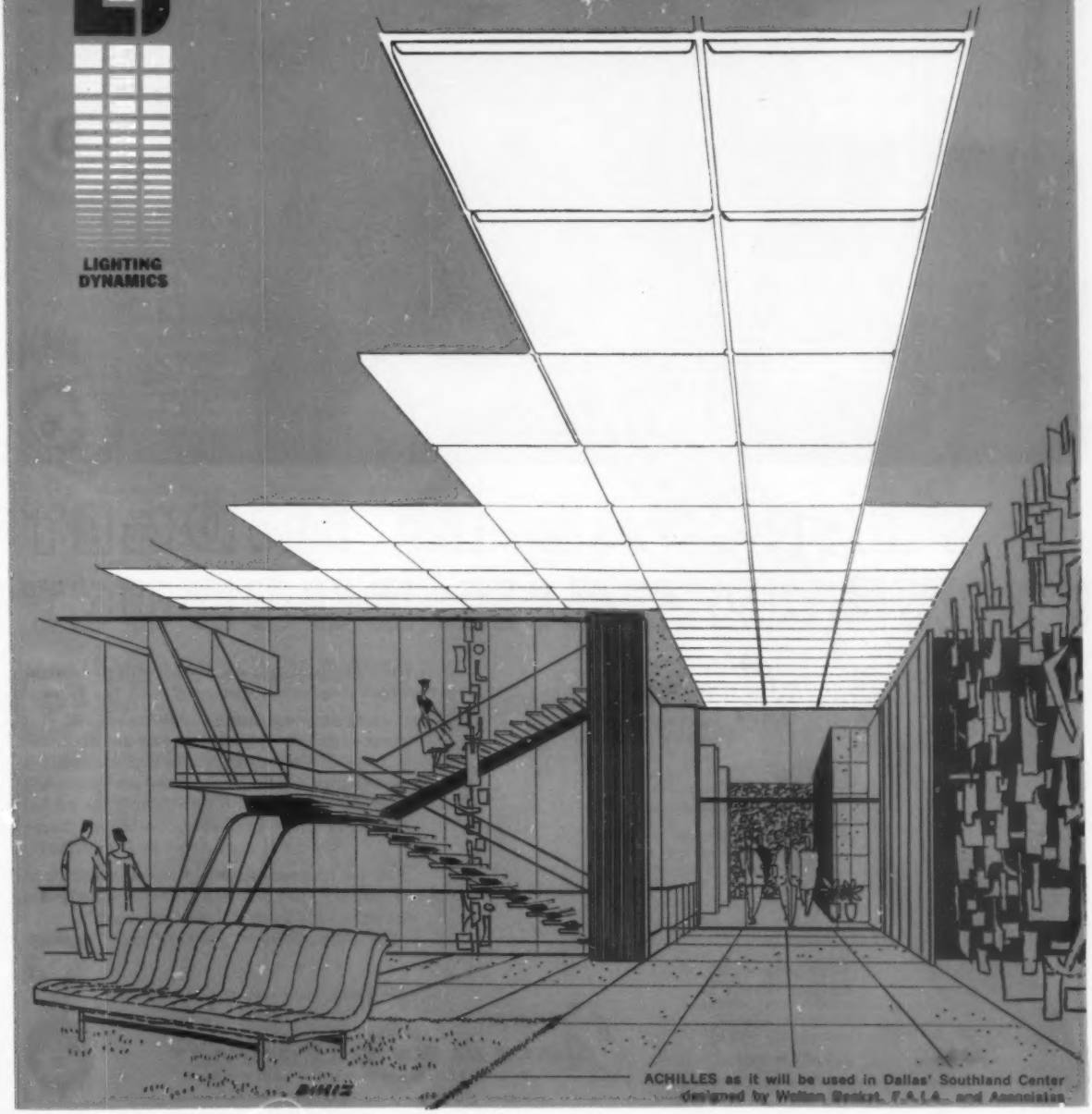
problem

An easily maintained, integrated fixture was needed for Welton Becket's dramatic "squares of light" ceiling in the lobbies and offices of Southland Life's spectacular 42-story Southland Center in Dallas.

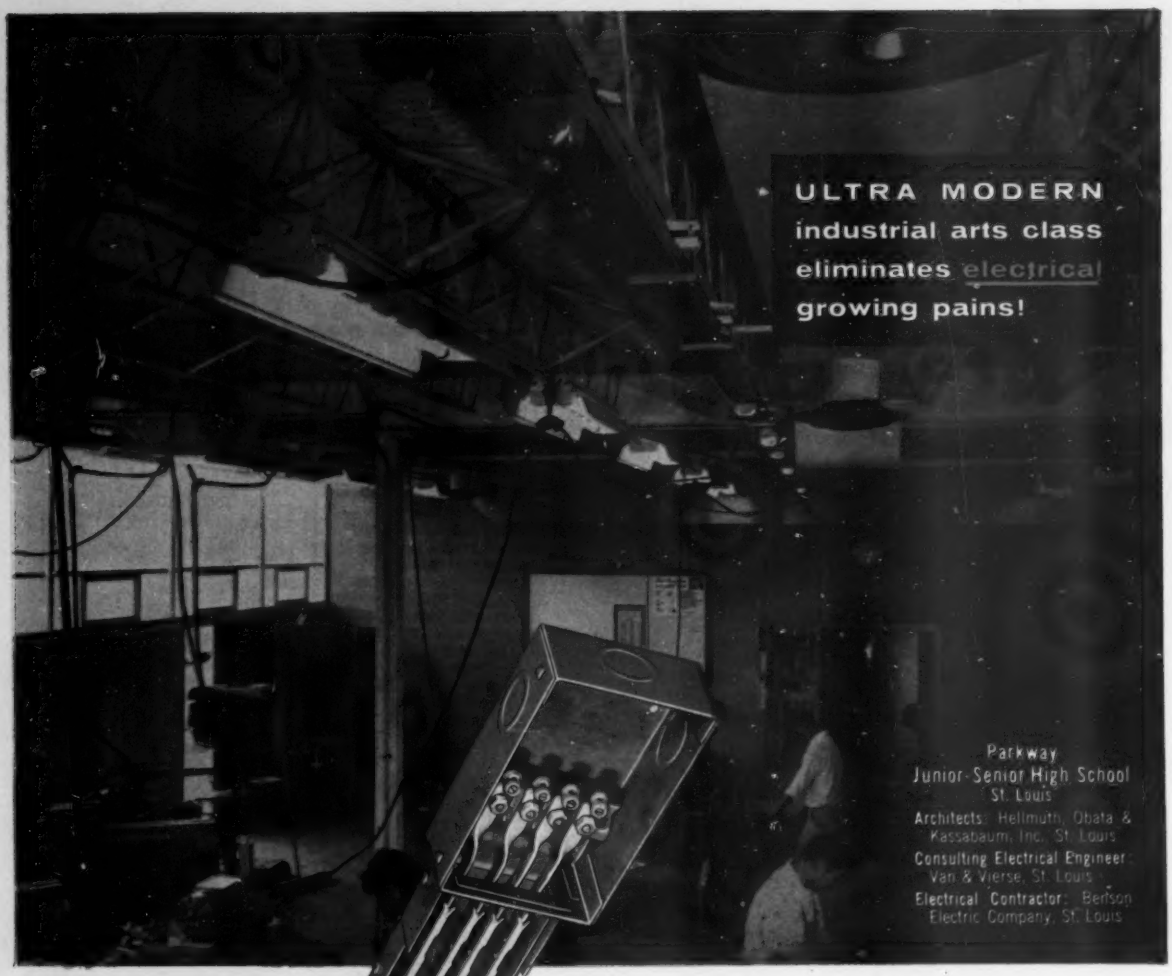
solution

ACHILLES by Lighting Dynamics was specified for the lobby... and it's companion Apollo was used in the offices throughout the center. Achilles is a highly versatile fixture series ideal for this demountable acoustical ceiling—just as it is for countless other ceiling suspension systems. It's quickly installed with a drop-in installation and has easy maintenance with press-to-open catches and hook-on hinges. Durable, Bonderized and electro-static, high-reflectance finishes... FOR MORE COMPLETE INFORMATION, call your Lighting Dynamics representative, or write to Lighting Dynamics, 802 West Whittier Blvd., Whittier, California or Lighting Dynamics, 8700 Ambassador Row, Dallas, Texas.

LIGHTING DYNAMICS



ACHILLES as it will be used in Dallas' Southland Center designed by Welton Becket, F.A.I.A., and Associates



FRANK ADAM MIDGET POWERPLUGIN BUSDUCT

Hangers—One for each 5 ft. of busduct. For ceiling or side wall installations.

Plugin Device—Two spring prongs attached to device, catch and lock on the inside of duct to form a rigid support. Also act as ground connection to duct.

Plugin Outlets on 12" Centers—Provide electric power where it's needed, when it's needed. 100 amps., 250 volts or less.

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Present classroom equipment can be moved and plugged-in almost as easily as an electrical appliance . . . the busduct quickly relocated if necessary. If additional busduct is needed for future expansion, it can simply be added to the old! Cuts costly rewiring—keeps electrical downtime to a minimum.

For an economical and versatile electrical power supply that will stay modern for years to come, specify and insist on quality built Frank Adam Midget Powerplugin Busduct.

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ELECTRICAL SOUTH

SERVING THE 18 SOUTHERN AND SOUTHWESTERN STATES

December, 1959 **Vol. 39—No. 12**

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LUMI-FLO

the proven 3 in 1 troffer

FROM A SINGLE SOURCE

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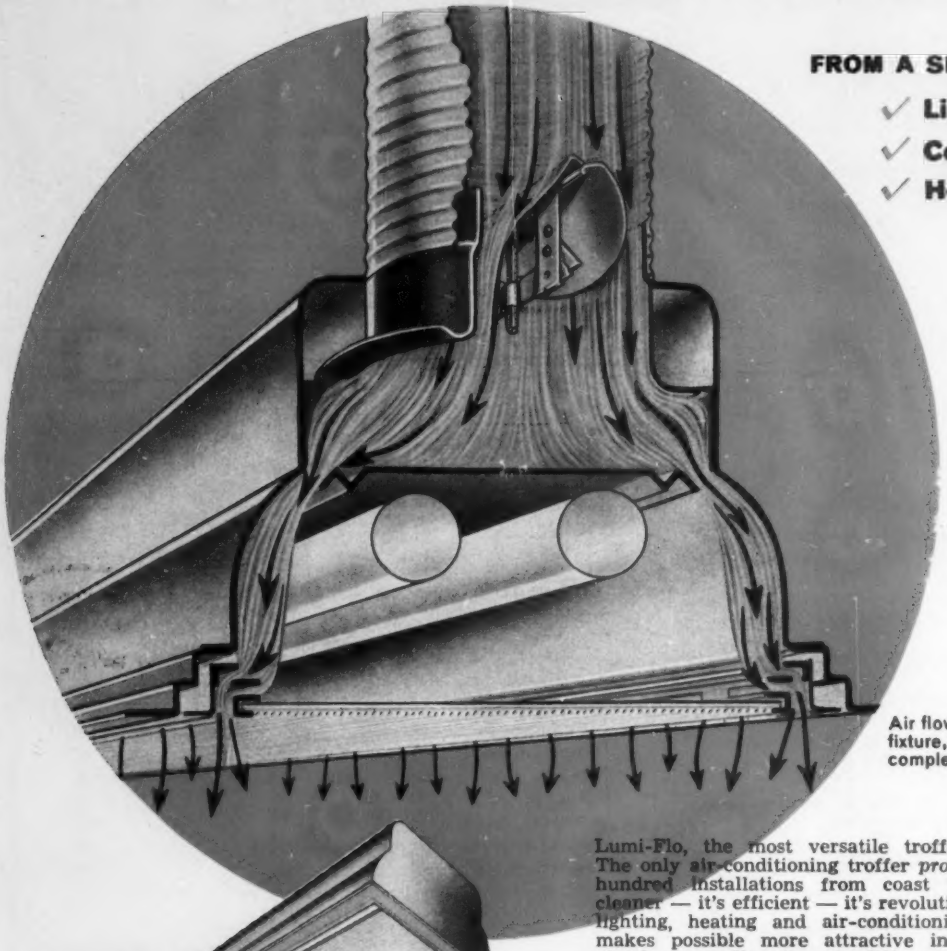

Air flows from duct through fixture, by-passing lamps completely.

Available in a variety of styles with glass or plastic lenses and aluminum or plastic louvers.

Lumi-Flo, the most versatile troffer ever created. The only air-conditioning troffer *proven* in over one-hundred installations from coast to coast — it's cleaner — it's efficient — it's revolutionary. Combined lighting, heating and air-conditioning in one unit, makes possible more attractive interiors by completely concealing the air diffuser, thus eliminating cluttered ceilings.

Developed and tested by the most respected name in the lighting industry, the Lumi-Flo troffer offers new engineering freedom for those who design with light.

For fixture engineering at its finest, look to Benjamin. Your local Benjamin representative will be happy to help you. Contact him on any problem . . . large or small.

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KAISER ALUMINUM RIGID CONDUIT

KAISER ALUMINUM

IS A SURE BET
TO LOWER COSTS

BECAUSE...

IT COSTS NO MORE TO BUY

And IT OFFERS COMPLETE ASSURANCE

Contractors everywhere are finding that the old ways aren't necessarily the best ways when it comes to buying and installing rigid conduit. The big money-saver is aluminum . . . for good reasons.

1 *Low initial cost.*

Today, aluminum conduit costs no more than steel . . . an important factor to consider when figuring your bid.

2 *Lower installed cost.*

Aluminum conduit weighs only *one-third as much* as the same size steel conduit. Result: easier handling . . . less worker fatigue . . . easier cutting, threading, bending . . . faster, more economical installation.

3 *Lower maintenance costs.*

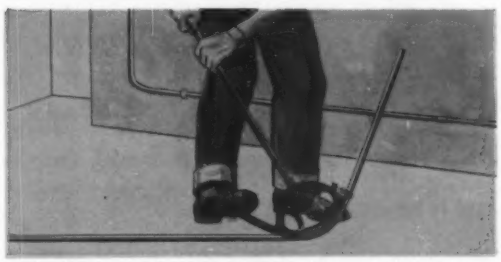
Because aluminum conduit can't rust and is highly resistant to corrosion, maintenance and replacement costs are virtually eliminated. Aluminum never needs painting, keeps its look of quality for years. Other quality features: aluminum conduit is nonmagnetic, which reduces voltage drop; non-sparking for safe use in hazardous locations.

IT COSTS LESS TO INSTALL

OF A QUALITY INSTALLATION!

10-ft. section of 4-inch aluminum conduit weighs only 34 lbs.; steel—98 lbs.

Aluminum conduit can't rust, resists corrosion—saves maintenance dollars.



Aluminum conduit is easy to work with—saves labor, time and money.

KAISER ALUMINUM

THE BRIGHT STAR OF METALS

See "MAVERICK" • Sunday Evenings • ABC-TV Network

HERE'S HOW TO START SAVING MONEY NOW...

SEE THIS MAN BEFORE YOU BID ANOTHER JOB!

AUTHORIZED
KAISER ALUMINUM
ELECTRICAL DISTRIBUTOR

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The man to see before you bid on another job is your Kaiser Aluminum Electrical Distributor. Compare prices—see how Kaiser Aluminum rigid conduit can give you the competitive edge on any contract.

Your Kaiser Aluminum Distributor has a complete stock of aluminum conduit sizes and fittings—*ready right now for delivery to your job site.*

See or call him today. Ask for a free copy of the Kaiser Aluminum Rigid Conduit Brochure containing comparative weights, installation details, and all the facts you need to lower your costs.

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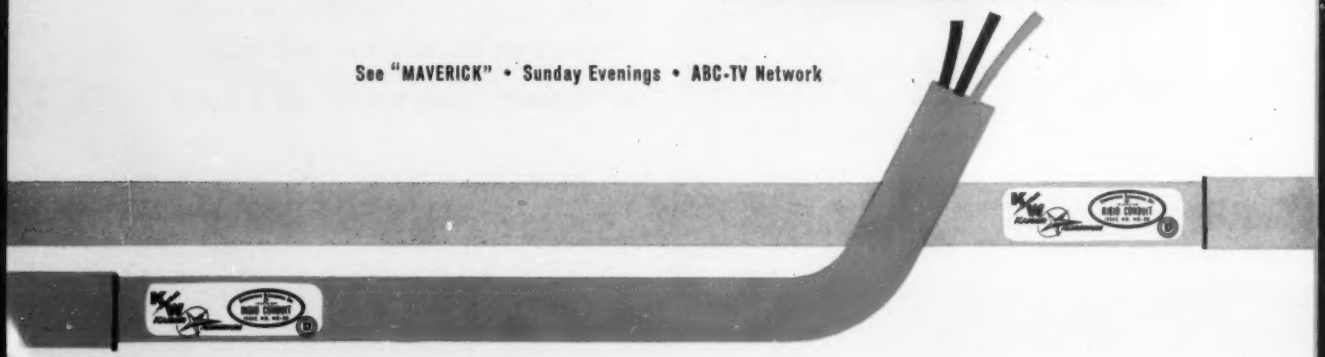
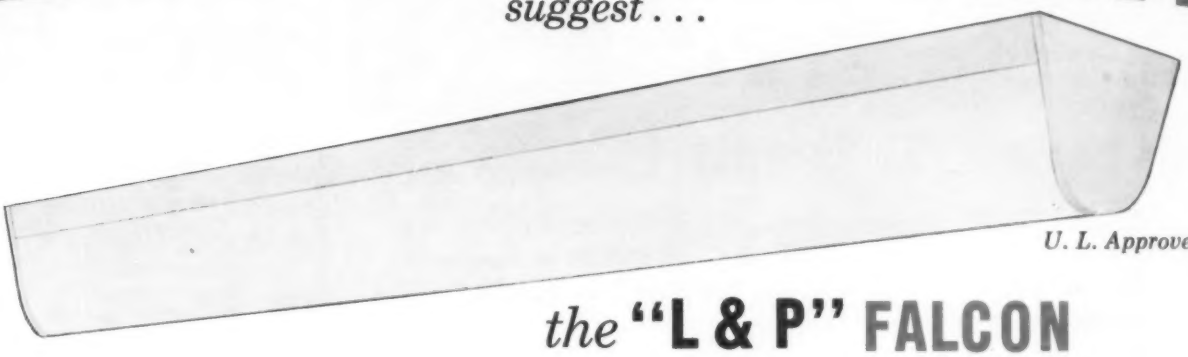


LIGHTING A CORRIDOR?

we suggest . . .



U. L. Approved

the "L & P" FALCON

APPLICATION:

These units have been specially designed for lighting corridors of schools, office buildings and institutions, and similar installations.

TYPE:

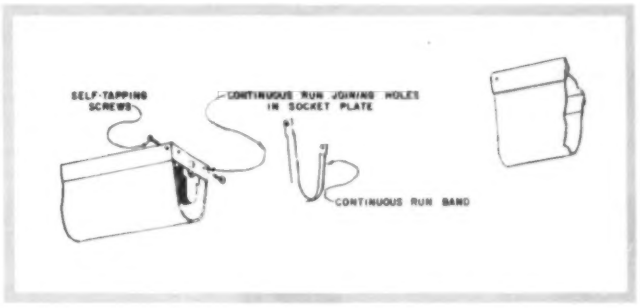
Rapid Start and Slimline. One lamp, tandem two lamp, two lamp or four. Plastic enclosed.

CONSTRUCTION:

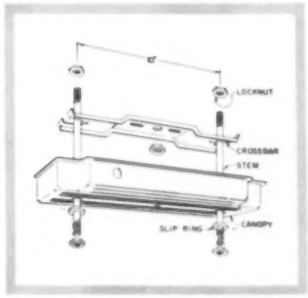
Heavy gauge steel construction. Connector straps replace ends at joints on continuous runs. Extruded, plastic enclosure snaps in for easy maintenance.

MOUNTING:

Fixture may be surface or pendant mounted. Designed for continuous row or single unit installation.



ST 124, single stem canopy set, used when joining fixtures on continuous runs. Normally two ST 124 sets are used for each individually mounted 8 ft. unit. Std. stem length 24".



ST 10, double stem canopy set. Used for suspending individual units normally not over 4 ft. long. Std. stem length 24".

Cat. Series HPC

For catalog and price sheets, write or phone today to

LIGHT & POWER UTILITIES CORP.

1035 FIRESTONE BLVD. • MEMPHIS, TENNESSEE

LIGHTING A RESTAURANT?

. . . we suggest the **L & P**

DELTA SKIRTED DOWNLITE

Cat. No. 440 and 445

All the quality, tested performance and economy that have earned Light & Power an enviable reputation in fluorescent fixtures are also available in the complete L & P Delta line of incandescent fixtures.

For your next restaurant installation check these features of the Delta Skirted Downlite before you select your incandescant fixtures!

TYPE:

Skirted Downlite.

CONSTRUCTION:

Heavy duty aluminum housing and perforated aluminum skirt. Complete with plaster ring. Designed to give plentiful glare-controlled light.

ELECTRICAL:

660W - 250V Heavy duty porcelain socket. Wired with 4½ foot No. 14 gauge A.F. leads. AFL-IBEW fabricated. UL approved. Wired for 110V - 60 cycle.

FINISH:

Perforated skirt brushed satin aluminum or satin brass. All parts sprayed with heat resisting lacquer and baked to 375° to assure permanent finish.

For catalog and price sheets, write or phone today to

DELTA delta incandescent division

LIGHT & POWER UTILITIES CORP.

1035 FIRESTONE BLVD. • MEMPHIS, TENN.

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Representative Near YOU!

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Craig-Owen
306 E. 11th St.
Chattanooga, Tenn.

C. V. Hammon
845 Southwest 52nd St.
Oklahoma City, Oklahoma

Irving Milow
415 Clover St.
Rochester, New York

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3627 Peachtree Rd., N. E.
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J. Louis Weyhing
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Louisville, Kentucky

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South Euclid, Ohio

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Catalogs and Bulletins — New Electrical Products
New Utility Equipment — Manufacturers' Literature

Be sure to print or write legibly your name and address—drop it in the nearest mail box and

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DECEMBER, 1959

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Send free information on these ADVERTISEMENTS:

Company_____ Page____ Company_____ Page____
Company_____ Page____ Company_____ Page____

My Name _____ Position_____
My Company's Name _____
Address (number and street) _____
City _____ Zone____ State____

DECEMBER, 1959

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My Company's Name _____
Address (number and street) _____
City _____ Zone____ State____

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ATLANTA 8, GEORGIA

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Electrical South
806 PEACHTREE ST., N. E.
ATLANTA 8, GEORGIA

CATALOGS and BULLETINS

Available Free to Readers of Electrical South upon Request

LIGHTING PANELBOARDS — A 4-page descriptive folder featuring a line of plug fuse and toggle switch panelboards for lighting control circuits is now available from Frank Adam Electric Co., 3650 Windsor Pl., St. Louis, Mo. The folder includes box sizes, details of construction, wiring gutters, special features, and catalog numbers.

Write in No. D100 on card, Pg. 11

CIRCUIT PROTECTION — A 24-page illustrated handbook contains suggestions for selecting the right kind of protection for electric circuits, motors, appliances and apparatus. Includes motor wiring diagrams and a complete list showing proper size fuses to use. Available from Bussmann Mfg. Co., University at Jefferson, St. Louis 7, Mo.

Write in No. D102 on card, Pg. 11

MODULAR LIGHTING—A twelve-page folder describing and illustrating their line of surfaced and recessed fluorescent modular fixtures is announced by Moe Light of Thomas Industries Inc., Lighting Division, 410 S. Third St., Louisville, Ky. Complete coefficient of utilization and candlepower distribution tables are included for each set of fixtures.

Write in No. D104 on card, Pg. 11

MANHOLE HEATER—A four-page brochure issued by Morrison-Pelsue Co., 2256 S. Delaware S., Denver 23, Col., describes and illustrates applications of the MoPeCo Ventilating Heater available in several models, electrical or gasoline engine powered.

Write in No. D105 on card, Pg. 11

LIGHTING FIXTURES—A four-section, 72-page catalog printed in full color is now available from EJS Lighting Corp., 921 E. Pico Blvd., Los Angeles 21, Calif. The four sections include hundreds of designs classified as residential, architectural, special, bullets and portables.

Write in No. D106 on card, Pg. 11

HYDRAULIC POWER TOOLS—A new bulletin describing their two-speed, fast-approach portable power unit for hydraulic tools such as conduit benders, cable pullers, and pipe pushers is announced by Greenlee Tool Co., Rockford, Ill.

Write in No. D108 on card, Pg. 11

CONDUIT WIREHOLDERS — A new information sheet describing their line of all-purpose conduit wireholders is now available from Knox Procelain Corp., P. O. Box 2031, Knoxville, Tenn. The illustrated sheet gives installation information, design features, and specifications.

Write in No. D109 on card, Pg. 11

LAMP GUIDES—Sylvania Lighting Products, 60 Boston St., Salem, Mass., has made available three lamp guides containing general information, technical data, and catalog listings on their lines of fluorescent lamps, incandescent lamps, and mercury lamps.

Write in No. D110 on card, Pg. 11

PLUGS, RECEPTACLES — Two basic designs — explosion-proof and weatherproof—of Killark plugs and receptacles are fully covered in a new catalog section. This line offers many advantageous features, and is available in many styles and sizes to fit various boxes. Killark Electric Mfg. Co., Easton and Vandeventer Ave., St. Louis 13, Mo.

Write in No. D111 on card, Pg. 11

ELECTRICAL DEVICES — Two publications, the pocket Federalog 111-PR and Bulletin 3-230, have been made available by Federal Pacific Electric Co., 50 Paris St., Newark, N. J. Complete details concerning circuit breakers, panelboards, fusible service equipment, safety switches, industiral motor control and lighting and power panelboards are contained in the 32-page pocket-sized catalog. The 8-page bulletin is devoted to the company's new line of QMQB fusible switches and panelboards.

Write in No. D112 on card, Pg. 11

BUILT-IN HEATERS—Thermador Electrical Manufacturing Co., 5119 District Blvd., Los Angeles 22, Calif., has announced the availability of three new catalog sheets on their line of built-in electric heaters. The heaters dscribed are their portable radiant-fan heater, electric ceiling heater, and baseboard electric heater.

Write in No. D113 on card, Pg. 11

PRICE SERVICE—Specimen copies of the National Price Service price books are available on request from Henderson-Hazel Corp., 13601 Euclid Ave., Cleveland 12, Ohio. Please indicate whether you are a contractor or wholesaler. Each specimen includes a complete index, a representative sampling of completely illustrated price sheets, and information of special interest to those concerned with pricing electrical construction materials.

Write in No. D114 on card, Pg. 11

FLUORESCENT FIXTURES—The new Miller Sabre fluorescent fixture is illustrated in the Sabre catalog, page 13, published by The Miller Company, Meriden, Conn. This page points out application, construction details, and dimensional, illumination, and installation data.

Write in No. D115 on card, Pg. 11

CABLE SUPPORTING TRAYS—The Globe Co., 4000 South Princeton Ave., Chicago 9, Ill., has made available a new catalog on their line of cable supporting tray systems and accessories. The catalog contains information on design features, specifications, and installation.

Write in No. D116 on card, Pg. 11

CENTRIFUGAL ROOF VENTILATORS—An 8-page, two-color folder (SDA-220) gives construction features, performance data, dimensions and recommended specifications for the new Centrifugal Roof Ventilator manufactured by The Peerless Electric Company, Warren, Ohio. Other important Peerless Fan and Blower products and a list of Peerless sales representatives are also included.

Write in No. D117 on card, Pg. 11

CONDUIT FITTINGS—Bridgeport Fitting, Inc., 209 Center St., Bridgeport, Conn., offers a twenty-six page catalog describing their line of conduit, bushings, lock nuts, couplings, nipples, supports, connectors, and other fittings. Size, weight, and packing details are included.

Write in No. D119 on card, Pg. 11

SPACE HEATING GUIDE—Cavalier Corp., Chattanooga 2, Tenn., has prepared a Guide for Calculations on Electric Space Heating. It is based on a study of several thousand installations of electric heat and is a handy reference for calculating electric heating requirements and stimating oprating costs. Th ebooklet contains dicussion, chars and floor plan examples.

Write in No. D120 on card, Pg. 11

CATALOGS and BULLETINS

Available Free to Readers of Electrical South upon Request

NON-METALLIC FIXTURES — A new complete condensed catalog with list prices covering their complete line of non-metallic lighting fixtures is now available from Union Insulating Co., P. O. Box 351, Parkersburg, W. Va.

Write in No. D122 on card, Pg. 11

CONNECTOR BULLETINS — Six new bulletins have been released by Ilsco Corp., 4730 Madison Rd., Cincinnati, Ohio. They cover the Ilsco line of solderless connectors, special connectors, lugs, neutral bars, crimp lugs, and the Ilsco Lok-A-Blok. The bulletins include descriptive material, dimensions, and packaging data.

Write in No. D123 on card, Pg. 11

TROFFER CATALOG—A 36-page catalog, with complete information on their newly re-designed architectural troffers has been released by Smithcraft Lighting Division, Chelsea, Mass. Divided into sections for selection of lighting units, the catalog gives complete illustrations and data for 1 and 2 foot troffers in all types of ceiling construction. Also included in the catalog is information on ceiling lighting patterns, shielding designs, lighting techniques and applications.

Write in No. D126 on card, Pg. 11

LIGHTING FIXTURES—Progress Manufacturing Co., Castor Avenue and Tulip Street, Philadelphia 34, Pa., announces the publication of two new lighting catalogs. "Lighting by Progress", a 52-page booklet, describes their line of residential fixtures. "Home Lighting by Minute Mount" is a 12-page bulletin illustrating new ideas in budget lighting.

Write in No. D131 on card, Pg. 11

MOTOR CONTRACTORS — For control of large motors, primay switching of induction furnace transformers, and other high voltage applications, **Allis Chalmers Manufacturing Co.**, Milwaukee 1, Wis., has developed the **high voltage air-break contractors** (type 256A) which are described in a bulletin issued by the company.

Write in No. D132 on card, Pg. 11

ELECTRICAL DUCTS — A brochure is now available from John-Manville, 22 East 40th St., New York 16, N. Y., describing their line of Transite electrical ducts. The two-color, 11-page, illustrated bulletin contains information on composition, methods of manufacture, applications, costs, and installation. Also included are shipping weights and dimensions of Transite conduit and Korduct.

Write in No. D133 on card, Pg. 11

TRANSFORMER MOUNTS—Universal Pole Bracket Corp., P. O. Box 8454, Houston 4, Texas has announced the publication of a catalog describing their line of transformer mounts and capacitor racks. The illustrated bulletin contains catalog information and data on design features, installation, handling, and warehousing.

Write in No. D134 on card, Pg. 11

TRANSFORMERS—R T & E Corp., 1900 E. North St., Waukesha, Wis., has available a bulletin describing Terra-Tran transformers for residential underground distribution. The 15-page booklet is illustrated and construction, application, and design features.

Write in No. D135 on card, Pg. 11

PIPE TOOLS—A new catalog containing dealers' net prices is now available from Nye Tool Co., 4120 Fullerton Ave., Chicago 39, Ill. The bulletin is illustrated and contains information on design features and applications of Nye pipe tools.

Write in No. D137 on card, Pg. 11

RADIANT HEATING — Ceilheat, Inc., 5212 Homberg Dr., Knoxville, Tenn., has announced the availability of a bulletin describing their line of concealed radiant home heating systems. The bulletin includes the principles of radiant heating, installation procedures, and advantages of this heating system.

Write in No. D138 on card, Pg. 11

LIGHTING FIXTURES — A 28-page, illustrated booklet from Lavery and Co., Inc., 15479 Starthern St., Van Nuys Calif., dehcribes their line of lighting fixtures for western, ranch, earl American, homestead, and ranch modern homes. Specifications and catalog data are included.

Write in No. D139 on card, Pg. 11

EXPLOSION-PROOF EQUIPMENT —"An Electrical Engineer Comes to Crouse-Hinds" is the title of a new 6-page folder by Crouse-Hinds Co., Syracuse 1, N. Y. The bulletin describes design and construction principles involved in manufacturing Crouse-Hinds Condulet electrical equipment for hazardous locations.

Write in No. D140 on card, Pg. 11

RESIDENTIAL LIGHTING — A new catalog featuring their line of residential lighting fixtures has recently been issued by John C. Virden Co., 6103 Longfellow Ave., Cleveland 3, Ohio. The 48-page booklet is illustrated and in color. It pictures and describes incandescent and fluorescent fixtures for every room in the house and every design motif.

Write in No. D141 on card, Pg. 11

HYDRAULIC EQUIPMENT—Truck Equipment Co., 3963 Walnut St., Denver 5, Colo., has made available a catalog containing information on their lines of hydraulic derricks, cable reel carriers, and diggers. It is illustrated and contains data on design features, specifications, and application.

Write in No. D142 on Card, Pg. 11

WATER HEATING BOILER — Precision Parts Corp., 400 N. First St., Nashville 7, Tenn., has available a bulletin containing catalog information on their electric hot water heating boiler, diagrams of the boiler, and data on the advantages of its use. The boiler comes complete with water circulator and safety valve on models A through K.

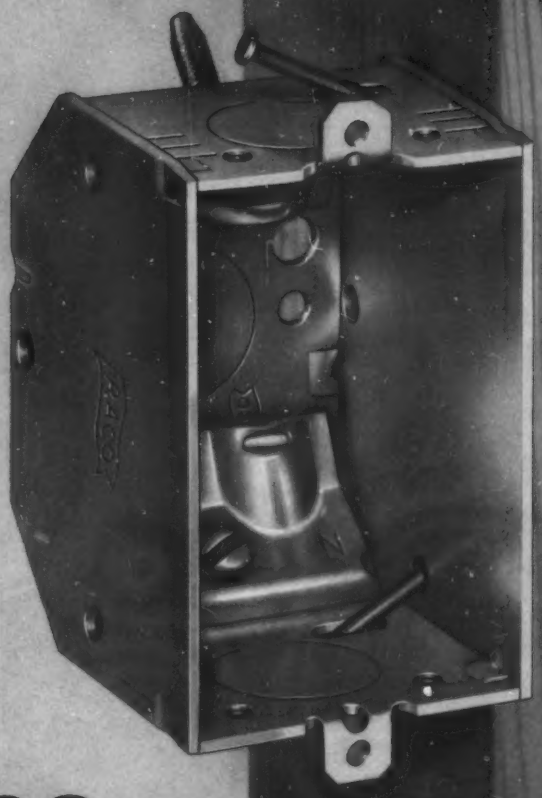
Write in No. D143 on Card, Pg. 11

FLOOD LIGHTING STANDARDS —An 11-page booklet describing their line of flood lighting standards is available from Kerrigan Iron Works, Inc., P. O. Box 479, Nashville 2, Tenn. Contained in the booklet are catalog data, diagrams of the equipment, specifications, and suggested methods of wiring supply to floodlights, as well as other installation procedures.

Write in No. D144 on Card, Pg. 11

CONNECTOR TOOLS—The Thomas & Betts Co., Inc., 72 Butler Street, Elizabeth 1, N. J., makes available catalog D59 including new compression connectors and installing tools recently developed. The tools are for use at usual distribution voltages and for "hot line" applications. New heavy duty tap connectors, double taps, stirrups and single sleeve ACSR tension splicers have many exclusive features and are designed to give high performance and easy installation.

Write in No. D145 on card, Pg. 11



New RACO WELDED SWITCH BOXES

...big cost savings...easier to install

New RACO welded switch boxes offer you these important advantages:

—big cost savings per box

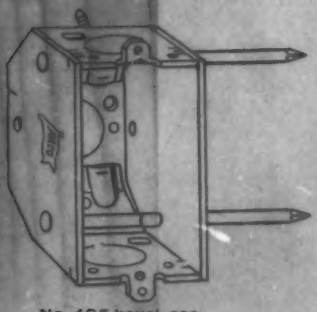
—greater strength because box is *projection welded*

—three sets of "straight-through" nail holes for faster mounting

—new knockout slots at each end for easy angle-nailing in tight areas

—flat sides for quicker, smoother installation

Your RACO Distributor has the new welded non-gangable, beveled corner switch boxes with or without staked nails, with or without ears. Try them now for greater savings, easier installation.



No. 495 bevel-corner box has staked nails for faster, easier installation

No. 492 is available with two screw plaster ears

ALL-STEEL EQUIPMENT INC.
AURORA, ILLINOIS

Economic comment

by J. Whitney Bunting, Ph.D.

Contributing Economics Editor

Consumer philosophy

One of the unique features of today's economic pattern in the United States, is the philosophy of the people in the purchase of goods and services. Two years ago, the nation was facing a recession with a slowly growing group of unemployed and the question of "how long" and "how severe" an economic decline was uppermost in many minds.

Today, a similar situation exists although triggered by a different causal factor. The steel strike, ended by a Taft-Hartley injunction ordering the workers back to their jobs, has promoted a heavy lay-off problem that has filtered through many industries that need steel or steel products for their operations. The automotive industry, is a prime example and, though steel workers are now back at work, many auto employees are still unemployed until such time as steel production can catch up with demand. Thus, to all extent and purposes, the unemployment in both periods is similar.

However, the philosophy of the unemployed is the different factor. There appears to be no restriction in consumer buying at the present time although it is difficult to see how so much confidence in the economic future exists. Even in areas most seriously affected by the industrial lay-offs, the retail stores are doing a good business—certainly well above depressed standards.

People assume that the present enforced idleness is purely a transitional experience and that upon a final settlement of the basic labor problem, there will be a rapid return to previous prosperous conditions. In fact, there appears to be only a limited belief that 1960 might not be as prosperous as predicted a few months ago. Merchants, through a liberal use of credit and installment selling, are feeding upon this almost universal belief that the present situation is only temporary and is a prelude to better things to come.

Perhaps it is this very optimism that will insure the prosperity expected by so many. It has often been stated that the greatest single factor causing business decline and depression is the state of mind of those engaged in business. Franklin D. Roosevelt's often quoted statement: "The only thing to fear is fear itself" was directed to just this fact.

There is a certainty that at the end of the present holiday buying period store inventories will be at their lowest levels in many years, and the restocking of shelves alone will provide tidy business opportunities for many producers.

And, as employment again inches back to record proportions, optimism among consumers should continue the high pace of purchases plus the gradual reduction of consumer debt currently rising very rapidly.

This is a sound basis for hope in the immediate economic future. There is just one dim problem in the future at this time.

What about other strikes?

Although the steel strike can hardly be termed as settled during the 80 day cooling off period, and the East and Gulf Coast longshoremen's dispute follows a similar pattern, there is the very real question of labor unrest in 1960. There are many contracts expiring throughout the coming year and it is a sound bet that negotiations will end in strikes of various lengths.

In many cases in the past it has been purely a question of wage adjustments or fringe benefits, and both labor and management could afford to give in a little on offers and demands. Now the situation is just a bit more severe for it embraces two distinct problems:

(1) Wage increases, for the most part, when given today have a direct effect upon prices. The creeping inflation to which this nation has been subjected over the past decade has just about reached its limit. Beyond this point, price increases may be injurious to future economic growth and development. The public is more knowledgeable today in regard to the perils of inflation than ever before in history and the pressures for a "hold-the-line" price policy are becoming heavier daily. This, of course, limits the ability of union leaders to achieve their goals of more money for their members.

(2) There is a second and even more vital problem for management in the 1960 negotiations. This is the basic question of management's right to manage the business enterprise. Many of labor's demands today go far beyond the salary and fringe benefit questions. They raise deep questions of management's right to set work standards, to automate production, to demand greater productivity in return for higher wage rates, and a host of other questions long considered to be management's special prerogatives in conducting business operations. It is certain that the managers of most major companies cannot and will not give up easily on these points.

What to do about it?

In years gone by, management was often unpopular with the general public in bargaining sessions. Labor leaders, classed as underdogs at the bargaining tables, were given public sympathy and often approval in their demands for better working conditions and better salary and wage payments. With the effects of inflation directly affecting millions of American homes today, labor leadership is hard-pressed to get public sympathy for further wage increases. They can easily see the effects of continuing inflation on the national standard of living, even upon jobs now directly challenged by foreign production with lower labor costs than in the United States.

The general public is not nearly as knowledgeable in regard to

(Continued on page 111)

Dr. Bunting is a well-known economist and educator having special knowledge of the South.

YOLOY CONDUIT AND E.M.T.

battle corrosion...last longer

Specify Yoloy (nickel-copper low alloy) steel conduit to handle applications where greater strength, corrosion-resistance, and weldability are required.

Yoloy Conduit should be specified for electrical installations where corrosion is expected to be more severe than normal. Research has proved Yoloy resists corrosion 4 times longer than carbon steel in marine and industrial atmospheres.

Yoloy steels have proved highly resistant to corrosion in oil fields, coal mines, railroad cars, motor trucks and highway construction equipment for over a quarter-century. Long-time tests and actual installations have proved that Yoloy pipe lowers costs when used for salt water lines, oil wells, industrial installations and corrosive soils.

Corrosion studies conducted for 14 years in 13 different soils show that Yoloy has 19% less pitting and 36% less weight loss than carbon steel—and 10% less pitting and 23% less weight loss than wrought iron. This proved corrosion resistance greatly lengthens the life of coatings—galvanized or enameled—on Yoloy Conduit.

Check with your Youngstown Representative and get the complete story on how Yoloy Conduit and E.M.T. can easily meet your most exacting job specifications.

The Youngstown Sheet and Tube Company, Youngstown, O. Carbon, Alloy and Yoloy Steel.

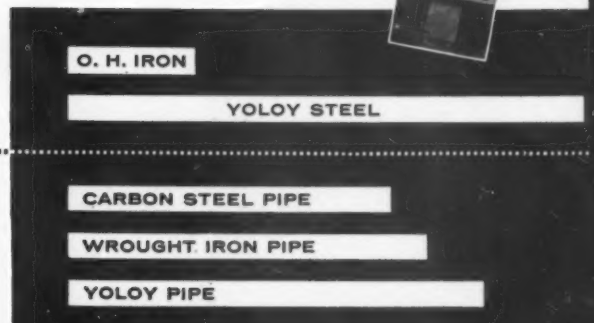
Send for free technical bulletin on Youngstown Yoloy Conduit and E.M.T.

QUALITY YOUNGSTOWN SERVICE

Youngstown

Atmospheric corrosion tests held off the coast of New Jersey revealed Yoloy steel will last four times longer than open-hearth iron.

Expected life increase of Yoloy steel over carbon and wrought iron in corrosive soils. Studies were conducted over a 14-year period in 13 different soils.



Washington report

By Jack James

Digest of Washington news of special interest to the electrical industry

No such thing as little inflation

Have your suppliers ever raised the prices on materials after you landed a big contract? Have labor costs ever risen much higher than you expected while you were in the middle of a job? Any contractor who has been in business long can consider himself lucky if neither of these things has happened to him. These are two signs of inflation. Inflation can nibble at profits and sometimes eat profits up.

Inflation has been defined by economists as too much money chasing too few goods. Naturally in such a situation sellers raise prices. Then your employees want high wages because their cost-of-living increases. If you are lucky, you pass the increases on when you land a contract.

There is no such thing as a "little inflation." A one per cent climb in the Consumer Price Index (put out by the Department of Labor) means a $10 billion loss in buying power to the public.

Knowing that none want inflation, it came as a shock to the writer of this column this fall to hear President Eisenhower and many conservative economists accuse Congress of forcing the U. S. Treasury to give a big push to inflation. This writer did not understand how this could happen. So he asked a number of economists. Here is their explanation:

A 41-year-old law bars the Treasury from paying more than 4¼ per cent interest on long term bonds. Though this ceiling may seem reasonable, the fact is that today people won't buy long term bonds unless they get higher interest rates than 4¼ per cent. The Treasury, therefore, can sell only short term bonds to finance the national debt.

Commercial banks, for the most part, buy these short term bonds. For each dollar a commercial bank has in bonds, it can conceivably make $5 in loans under Government regulations. A sale of $2 billion of these bonds to commercial banks means a potential of $10 billion more in loans. Thus the sale of a relatively small amount in bonds can give inflation a big push by creating a vastly greater amount of money. (The amount of goods, of course, does not increase.)

Commercial banks are not as big buyers of long term bonds as of short. Many investors and savers buy long term bonds. These people don't make loans. Hence the bonds they buy are non-inflationary.

This fall Congress failed to remove the 4¼ per cent interest ceiling on long term bonds although President Eisenhower urged the removal. Congress apparently had an eye on saving a few million dollars in interest payments forgetting that these payments would be a pittance beside the billions in buying power lost through inflation.

When Congress reconvenes in January, President Eisenhower plans to again ask it to remove the interest rate ceiling. If Congress balks, this problem may become a big issue in the forthcoming presidential campaign.

Safety emphasized in Capitol face-lifting

Under the eyes of 30,000 tourists daily, contractors are giving the nation's Capitol a face-lifting. The work has been going on for two years and won't end until fall next year. So far only two workers have been injured so severely that they lost time on the job. Prior to the start of work the contractors met with the architect and set safety regulations to cover the work of hundreds of employees. Here are the regulations:

—Portable electric hand tools must have polarized cords with a wire grounding conductor. All temporary wiring, plugs, and outlets, except lighting circuits, must have these grounding wires. Grounding wires for portable electric equipment can not have a resistance exceeding 25 ohms.

—All excavations more than four feet deep must be adequately shored or have banks cut to angle of repose of material when saturated. The exceptions are holes in hard rock or hard shale.

—All protective apparel and equipment, goggles, hard hats, etc., must be readily available and used as required.

—Portable drinking water dispensers must be sterilized weekly and salt tablets furnished when necessary.

—Cranes and other load-lifting equipment must be inspected by qualified persons at the start of each shift.

Louisiana court enforces IBEW arbitration award

The United States District Court for eastern Louisiana upheld an arbitrator's award of back wages to employees of the Mississippi Valley Electric Co., represented by Local 130, International Brotherhood of Electrical Workers.

The Court said: "The arbitration machinery set up in the contract is what the parties agreed to, presumably because it was best suited for the purpose intended. It is a comprehensive, fair, and final method for settlement of disputes, binding on both parties."

Background of the case is this:

The South Louisiana Chapter of the National Electrical Contractors Association, representing Mississippi and other electrical contractors, negotiated an agreement with Local 130 in July 1957.

The contract included job classifications, minimum wage rates, and an arbitration procedure. Local 130 charged that the electric company paid too low a wage rate on one of its jobs and also sublet part of its work to non-union contractors. The union carried its grievance to an arbitrator who awarded back pay.

Mississippi Valley Electric protested contending that a union "cannot sue to recover unpaid

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CIRCLE F WIRING DEVICES

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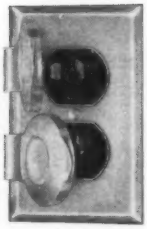

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CIRCLE F devices give you everything you want—and you save money, too! High quality, low cost Circle F wiring devices provide fast, easy installation, trouble-free service and eliminate call-backs. Precision engineering and quality-controlled production plus rugged construction guarantee customer satisfaction. Circle F devices are available at Electrical Wholesalers everywhere for quick pick-up or delivery.

*Only one of a complete line. For additional information, write for catalog.

CIRCLE F MFG. CO.

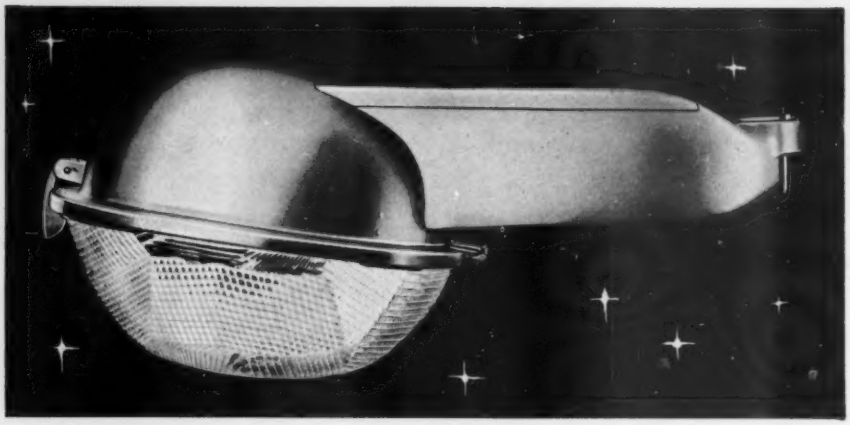
TRENTON 4, NEW JERSEY • For your wire requirements: Eastern Insulated Wire Corp., Box 591, Trenton, N. J.

STYLE 69 Pemco 400 watt Mercury Luminaire with built-in ballast —

Constant wattage — 100-130/200-260 V.
Constant wattage — 200-260/400-520 V.
Reactor type — 240 V.

Available with NEMA standard twist lock adapter for photoelectric control. For 2" end mounting, or 1¼" mounting by using spacer clamp.

Request Bulletin 124 for specifications and construction details.



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NEW ADVANCED DESIGN

400 WATT MERCURY LUMINAIRES

with Pemco-Holophane Refractor

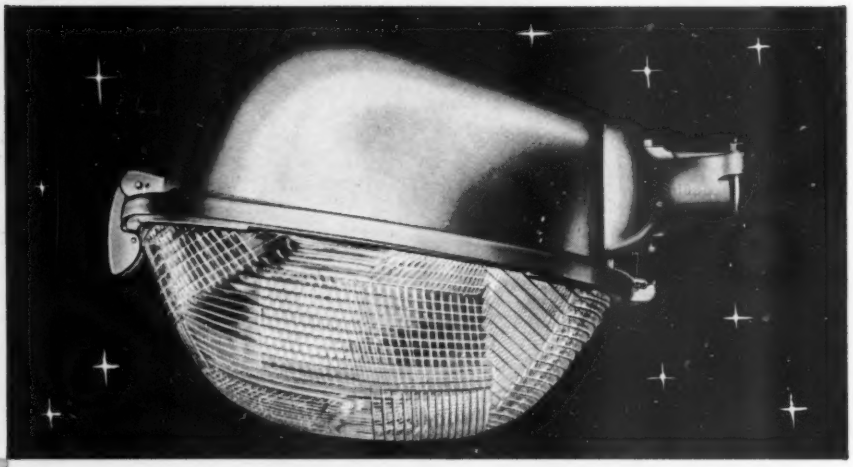
IES Types II, III & IV

STYLE 68 Pemco 400 watt Mercury Luminaire.

Available with NEMA standard twist lock adapter for photoelectric control. For 1¼" or 2" end mounting.

Performance curves on this and Style 69 on application.

Request Bulletin 122 for specifications and construction details.



PEMCO LIGHTING HAS BEEN QUALITY LIGHTING SINCE 1882

PHILADELPHIA ELECTRICAL & MANUFACTURING COMPANY

1200-36 N. 31st Street • Philadelphia 21, Pa. • P. O. Box 8359

Because Spang Conduit is uniform throughout, bending was quick and accurate. The strong-bonded galvanized finish did not chip or flake.

Here's why SPANG STEEL CONDUIT was installed at UFG's Kenova Compressor Station

Past Performance—United Fuel Gas Company has been a Spang customer for some time. Based on past performance, Spang Steel Conduit was chosen to protect the wiring in the million-dollar expansion and modernization of the compressor station at Kenova, W.Va.

Safety—Electricity and natural gas are not compatible. So, to provide complete electrical safety, all overhead and exposed wiring is being encased in Spang Steel Conduit.

Corrosion Resistance—Metal corrosion is a problem in natural gas compressor stations. But, Spang's heavy-duty galvanized finish will provide the required protection to assure long and satisfactory service in this installation. Above 50% of the conduit runs will be encased in concrete.

Easy-to-work-with—Electric crews on the job report Spang Conduit bent uniformly, was easy to cut, thread and join; color coded plastic thread protectors saved time in choosing correct sizes from stock, and the steel banding kept conduit bundles intact and easy to handle.

GET QUALITY INSTALLATIONS WITH SPANG—Buy it. Try it. You'll see how Spang product uniformity helps you get best results on any conduit job. Your local Spang Distributor carries the complete line of Spang Conduit, Couplings and Fittings.

General Contractor: Dravo Corporation, Pittsburgh, Penna.

Electrical Contractor: Schoolfield Harvey Electric Co., Charleston, W.Va.

SPANG Distributors: Graybar Electric Company, Charleston, W.Va.; Charleston Electrical Company, Charleston, W.Va.; Banks-Miller, Huntington, W.Va.

Conduit is exposed in outside lighting locations. Spang's corrosion-resistance qualities will protect wiring in all kinds of weather. Circuits carry loads from 110 to 440 volts.

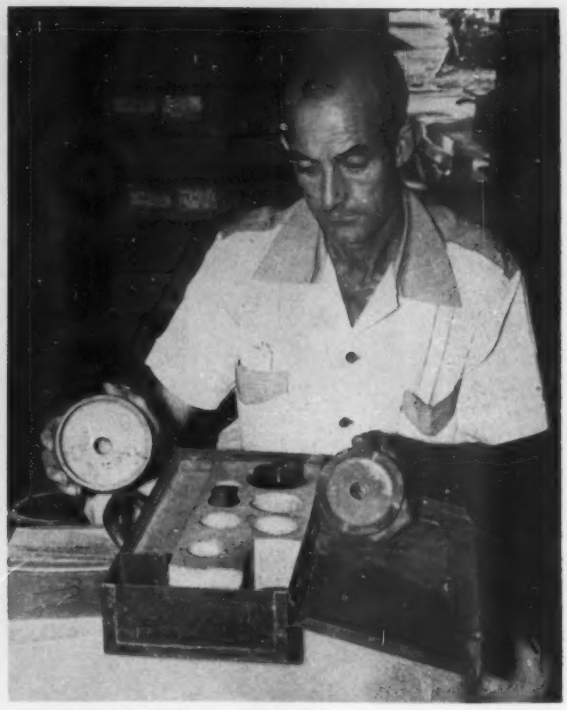
SPANG CONDUIT

THE NATIONAL SUPPLY COMPANY

Subsidiary of Armco Steel Corporation

TWO GATEWAY CENTER, PITTSBURGH, PA.

Doyle counts as a good investment his $500 in this machine for making plastic nameplates for switchgear and panels. Operator is Stockman Clifford A. Tharp, now in the process of installing a checking system using the labels to keep track of tools.



If tools are to operate at maximum efficiency, such accessories as these power hydraulic knockout dies, shown by Eugene Doyle, must be kept in perfect condition right up to their failure. Doyle carefully instructs his working force in proper handling of them.

Obsolescent equipment steals

Doyle believes a tool is obsolete the moment a better and more efficient tool is put on the market.

Apportioning the use and delivery of expensive tools on a series of jobs takes foresight and planning.

If sufficient trenching work is on the contractor's agenda, then an investment in a machine is advisable, according to Doyle. A low-wage worker can man it. With all labor so expensive today, any tool that will make a worker's time more productive is a desirable acquisition, so long as its cost balances the frequency of its use.

contractor's profit

By W. H. Doyle
Doyle Electric Co.
St. Petersburg, Fla.

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities
- Electrical Wholesalers ✔
- Electrical Inspectors
- Industrial Engineers ✔
- Consulting Engineers

◆ A CONTRACTOR'S business may be slowed down by obsolescence, particularly in the area of balancing men and labor-saving tools practically and profitably.

With labor so expensive, any tool that will make the contractor's workmen more productive is a desirable acquisition, so long as its cost is weighed against the probability of, and frequency of, its use.

While we generally work about 80 men, and carry a power tool inventory of $8,000, we shy away from buying such items as scaffolding which experience has taught is better rented since it gets "lost" so easily. On the other hand, such tools as pipe benders, power vises, underground pipe pushers, electric welders, and fully-outfitted line trucks and other equipment, we feel are better owned since they fit into our continuous pattern of operation.

Multi-use tools

Our thinking is that if there is enough work for a tool on a particular job to pay for it, it's good business to buy it.

For example, consider the merits of buying a 2-inch bender that bends a full 90 degrees, against the alternative of buying factory-made nipples, couplings, and ells. In such a case we weigh the difference in cost between buying the factory-fabricated materials against the price of the pipe, bending, threading, cutting, and assembly by our mechanics.

Besides this reasoning, we estimate that our own bender will enable us to fabricate many nipples of the heavy pipe in the shop, thus saving lugging the machine to the job. And by keeping the machine in the shop, we may put it to work making up similar bends and nipples for other jobs running at the time.

For instance, one of our yard lighting jobs in a shopping center called for the erection of 50 poles. With the insertion of two 2-inch ells in the concrete base of each lighting standard, we made a saving of $300.92 by using a bender for this particular job. Since the bender cost $200, it paid for itself on the one job.

Analysis of operations

Generally the volume and kind of work dictates the volume and kind of tools needed, and this requires the contractor to make a critical analysis of his operations. A reputation for being a well-equipped shop is a definite sales aid in attracting trade. If the contractor's basic concern is increased productivity from his men, or if he is on a cost-cutting hunt, he is wise to consider the nature and extent and suitability of his labor-saving tools.

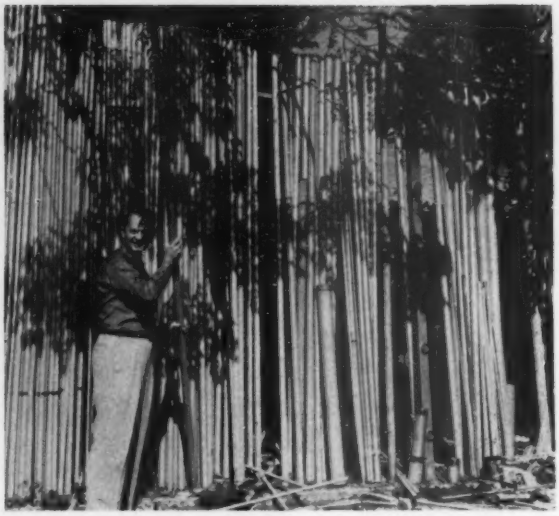
Tools may be in short supply in his organization, in such poor order as to be unsafe for use, or incapable of rendering their original service, or they may have reached the point of obsolescence.

Sure, there are some very useful tools whose purchase for our organization is not justified. Take a hydraulic compressor for lugs and high circular mil cable. They do a terrific job compared to split bolt connectors or pressure lugs, but if we only envision a once-a-year use of the machine, buying it and letting it collect dust in the interim is poor management practice.

We figure tools and equipment in at 10 per cent of the job's net

(Continued on page 108)

Trucks are loaded with all tools and materials each afternoon so electricians get to jobs on time.



This conduit rack right on the truck parking and loading lot has proved to be quite a time saver.

Productivity increased through

By S. W. Ellis

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities
- Electrical Wholesalers ✔
- Electrical Inspectors
- Industrial Engineers ✔
- Consulting Engineers

◆ KEEPING twelve electricians at work eight hours each day, strictly on electrical work, with no wasted minutes, is the basis for the fast and profitable growth of C & C Electric Construction Co., Little Rock, Ark. To accomplish this efficient utilization of time, Contractor Russell H. Clark has set up a program of time-saving routines, backed with the use of power tools.

Proof that Clark's operation is effective is the fact that he started his contracting business less than four years ago, with limited capital borrowed on his small home. Now he does a quarter of a million dollars in yearly volume, and recently has completed several contracts totaling up to $100,000 each. His eight equipped trucks and station wagons go all over the state, and he operates in his own building which is half paid for.

Conserves men's time

"My policy of conserving all of the electricians' time for actual electrical work makes the men more efficient and sometimes means the difference between a profit or a loss on a contract," Clark commented. "A lot of contractors I know lose money because their electricians are not ready to leave the shop promptly at eight o'clock. They leave at 8:15 to 8:30, and do not get to work on the job until 9 o'clock. I plan for my men to be at work a little after eight. To accomplish this, they come to the shop at 7:45. I am here at 7:20. The early arrival gives us time for a quick conference. The men then go to their trucks, which have been completely equipped the previous afternoon, with fuel, tools, and materials.

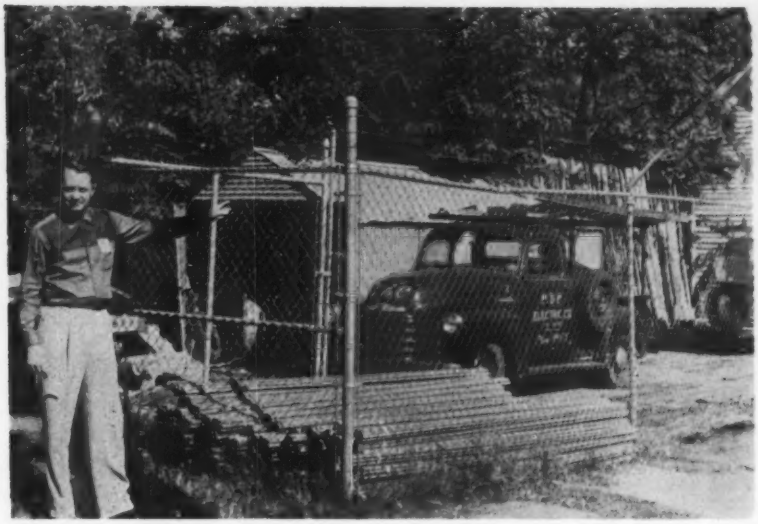
"To make equipping the trucks in advance easy and economical, this job has been turned over to a truck driver. The $500 I spent to enclose the lot with a chain link fence was one of the best investments I have made for saving time. That fence saves us three hours every day. We don't have to be careful now about keeping valuable materials under lock. The equipped trucks remain out all night. And since we have had the fence, there has not been a loss in material or tools."

A loading platform at the end of the shop helps to expedite loading and unloading. Another labor-saving device is the conduit rack on the lot. Trucks back up to this, and the conduit is placed rapidly on them.

Specialists developed

The twelve electricians never do a job that another member of personnel can do more profitably. They do not drive trucks nor do any common labor. They do not even do electrical work that another electrician can accomplish faster or better. The men are all specialists, each picked for what he can do best. Clark keeps in touch with local union members, so that he can learn the special abilities of each man whom he might employ when extra electricians are needed on a large job.

"Some of our men are best on trouble shooting," he explained. "I keep them working on this. On the other hand, some of my best construction men are not good or fast on trouble work. I know



Contractor Clark points to loading area fence which has saved the company considerable time. Trucks can be loaded and left in area.

Conserving valuable electrician's time, drivers are employed to load and drive the trucks.

time-saving plans

which ones are skillful on control, and which ones are the best conduit men. Putting a man to work where he fits best is more profitable for me and makes the man happier on the job."

It is Clark's policy to avoid having to lay off any of his twelve regular men. If the shop is running low on work, he takes one big job at no profit in order to keep the men busy. The five key men receive a very generous Christmas bonus. The other seven, newer in his employment, are kept satisfied and efficient with the time-saving routines that enable them to work without being under pressure.

Keeps men contented

Having been employed by several of the large electrical contractors of the area before he started his contracting business, Clark learned what keeps an electrician contented and efficient, and he applied his findings to his own business.

"Time - saving routines and enough power tools for all the men to use help me to hold my men and make more profit on labor. I have worked for contractors much larger than myself who did not own the power tools I furnish all my men."

He can complete a contract up to $100,000 with the tools he has on hand. His regular tool list includes seven drill motors, in sizes of ¼", ⅜", and ½"; 8 sets of hydraulic knockout cutters, 1 set going up to 4"; hydraulic benders in 3", 4", and 5", with 12 sets of dies.

Clark affirms that these basic tools cut labor costs and add to the efficiency of his men.

One of the most valued tools is the portable power pipe threader, for cutting and threading pipe at the shop as well as on the job site.

When Clark finds the need for an additional power tool, he does not hesitate to get it. Power tools that save time and labor costs are investments, he declares.

One regular employee at the shop checks in the tools each time they are used and stores them after cleaning.

In the buying and handling of materials, time-saving routines also are maintained. An $8,000 stock of materials is kept at all times in the warehouse for small jobs and trouble work. On larger jobs, materials are bought direct from the wholesaler and shipped to the job. Clark explains that if materials are shipped to the shop,

(Continued on page 110)

Typical of many power tools that are paying for themselves through time saving is this portable pipe threader used at shop and on jobs.

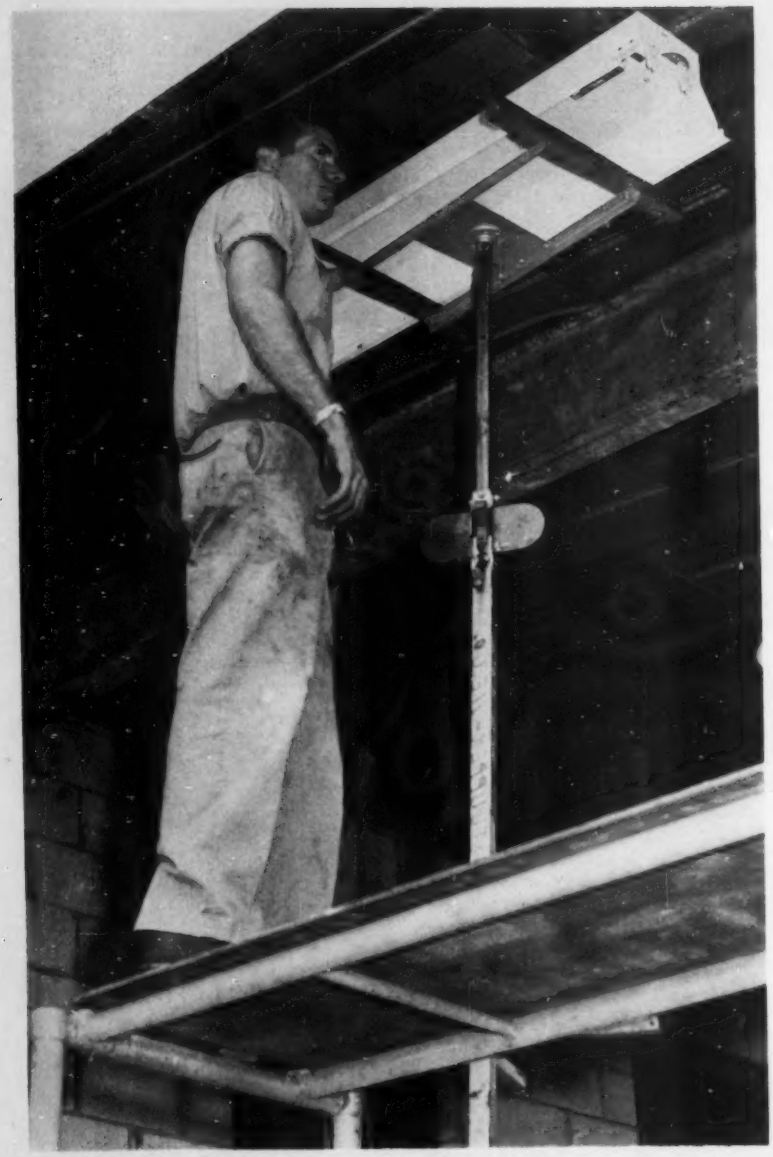
Material lists for each days jobs are made up the afternoon before and turned over to truck drivers so that they can load trucks and have them ready to leave at 8:00 A.M.

Shortcuts reduce some long costs

By Ross L. Holman

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities
- Electrical Wholesalers ✔
- Electrical Inspectors
- Industrial Engineers ✔
- Consulting Engineers



This scaffold utilized by Ramsey Electric features an adjustable rack which holds large fluorescent fixtures in place while they are being attached to ceiling or supports. Donald Ray Wolfe demonstrates how one man can mount large fixtures with this type of scaffold.

◆ LOU BALDINI feels that a few time-saving ideas on a contract job may mean all the difference in the world between a profit and a loss. Lou is the engineer-estimator for Ramsey Electric Co., at Nashville. Under his planning Ramsey Electric has handled some of the largest wiring and installation contracts of that area.

These include the Ford Glass plant just outside the city where the Ford Motor Company manufactures the glass for its motor vehicles; the Marquette Cement Company; the huge new Sears, Roebuck store; the state's Cordell Hull Office Building; and others.

Reel holder developed

At the Ford plant job Baldini had a number of those heavy reels of cord wire weighing up to 5,000 pounds each. He had to move these to and from a storage area 1,000 feet from the location where the wire was to be used. Generally speaking, the only way in which these giant spools are moved from one place to another has been the hard way, involving a lot of main strength and awkwardness. Baldini, through the use of a little brain strategy, now gets these reels moved in one-half the usual time by a carrier that picks up the reel clear of the ground. After that the carrier is pushed somewhat like a wheelbarrow by two men to where the reel is needed.

Mr. Baldini designed this device himself. The carrier is a sort of framework conveyed by two wheels located about midway between the ends of the framework. Either end can be tilted to the ground.

In order to move one of the reels with this carrier, a pipe is first run through the hole in the center of the spool of wire with the pipe ends projecting out on each side of the spool.

The two-wheel carrier is then pushed to the spool and lowered enough to hook the two ends of the

pipe projecting on each side of it. The men at the other end of the carrier then tilt the spool clear of the ground and roll it to where it is supposed to go.

Baldini says that this method of moving the reels on the Ford job not only saved half the usual time but saved the labor of one or more extra men that would otherwise have been needed. Wire on the spool can be unwound from its position on the carrier.

Baldini has also made a larger reel carrier that can be towed over streets and highways behind a truck or trailer. This one is mounted on two truck wheels with inflated tires.

While making the electric installations at the Ford plant, Baldini dreamed up some more short-cut techniques. Many of these have served him to good advantage on other contracts.

This reel carrier developed by Ramsey Electric, of Nashville, has proved to be a real time saver. Iron pipe through reel can be hooked into convenient notches and then rolled about like a wheelbarrow. A larger one has been built on same principle and can be towed behind a truck.

Handling heavy equipment

One of the smartest things he did out there was working out a simpler, easier method of moving generators across several hundred feet of floor space to the generator bases provided.

They say necessity is the mother of invention and invention is the one dependable factor that has always kept civilization from being let down. On this occasion, the 5,600-pound generators could *not* be moved over the floor by the usual method. That would have involved working each one on top of some iron pipe or round wooden rollers and inching it forward with a lot of pushing manpower. The reason they couldn't be pushed to their installation spots in this way was due to the cement floor being studded with bolts that projected above the surface.

This dilemma was what made it necessary for Baldini to engineer a new method of generator-moving. And it was a good thing he did so, for his idea proved to be much simpler and quicker than the iron-pipe-roller system, even if the bolt projections hadn't been in the way.

He dreamed up a four-wheel dolly that stood high enough above the floor to clear the bolt projections. Each generator was set on the dolly as needed by a tow motor forklift and the dolly pushed to the appointed location. The dolly had two swivel wheels with which to steer it to the generator base.

Baldini says it would have taken a crew of men a week to have moved all twelve of the generators the usual way. His dolly transport system did it all in one day. On the basis of that much difference one can figure that a lot of labor cost was saved on the contract price.

This rolling work bench has pipe vise on one end and pipe bender on the other. Locked compartments provide space for storing other valuable portable tools. Lou Baldini is shown checking blueprints.

Baldini eliminates another bit of drudgery in the installation of fluorescent light fixtures. In attaching such fixtures to a ceiling, he no longer uses two men to hold the heavy lamps in place while the attachments are secured. He uses a sort of scaffold that adjusts up and down as needed. This scaf-

fold was designed by the Harlan Electric Co., of Detroit.

Time saving scaffold

The scaffold platform works up and down a center rod. It is pushed up the rod by the tension of two heavy coil springs using a control mechanism. The fluorescent fixture is laid on the scaffold platform which is elevated by the spring as close to the ceiling as needed for easy attachment. This adjustable scaffold, as one can readily see, saves quite a number of costly man-hours that would otherwise be needed to hold the fixtures in place while being attached.

Another time saver on all contracts is a rolling work bench 8 or 10 feet long mounted on dolly wheels. This work bench has compartments enclosing all the tools needed as it is moved about for a specific job. The compartment doors can be locked when not in use.

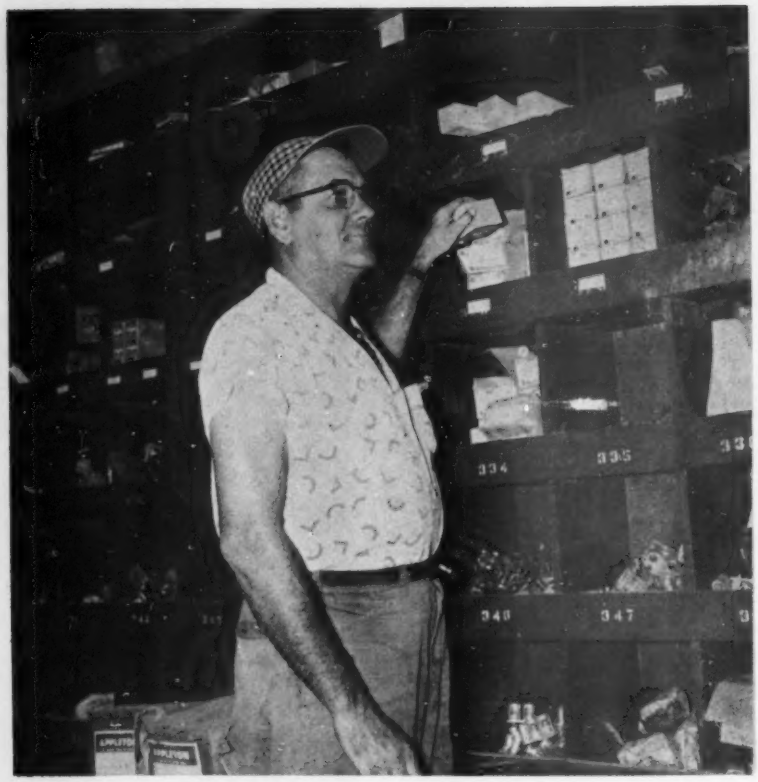
On one end of this rolling bench is mounted the pipe bender. On the other end is the pipe vise. The pipe bender, by the way, is another tool Baldini has remodeled to save much time. His time-saving pipe bender arrangement is an adaptation he made to the Black Hawk hydraulic bender.

The usual method of bending pipe with the Black Hawk is to lay it on the floor or bench in a horizontal position. By this method the pipe has to be removed several times during the bending process to gauge the amount of bend until the exact degree of bend is reached. Baldini's newly adapted method involves setting the Black Hawk in a vertical position. With some additional aids, including a protractor, he can now bend each pipe to the exact number of degrees needed before taking it out.

Lou Baldini has been worth a lot of money to Ramsey Electric in the number of money-saving and time-saving ideas he has engineered. There are two such innovations in the Ramsey shop itself that seem simple enough within themselves but they are the kinds that have cost other shops a lot of labor expense by not having them.

One of these is a chain hoist that operates on an overhead iron beam. When a truck backs up to the shed with a load of weighty equipment this hoist lifts the items out of the truck with the greatest of ease without calling in a lot of

(Continued on page 37)



Neatly kept stock bins at Bagby Elevator and Electric Co., Birmingham, are a great deal of help in maintaining visual stock control. Two full-time warehousemen operate the check-out system on tools and supplies.

Buying and warehousing practices

By Wendell Givens

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electrical Utilities
- Electrical Wholesalers ✔
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

James A. Brakefield, electrical division superintendent, claims that one of the best opportunities for increasing profit in electrical contracting is to be found in the buying and warehousing end of the business.

◆ BUYING AND warehousing practices will make or break many electrical contractors in the years ahead, says James A. Brakefield, electrical division superintendent for Bagby Elevator & Electric Co., Birmingham, Ala.

This statement is not meant to minimize other factors such as labor costs and job-bidding, Mr. Brakefield explains, but labor and bidding are becoming more or less standardized in the industry. Buying and warehousing are not.

A checkup on what the Bagby company has done in the last five years to put its warehouse in order, and a look at its plans for the future, show clearly the importance the company attaches to these phases of its business.

A few years ago Bagby, despite being one of Birmingham's busiest electrical concerns, was operating from an overcrowded, inadequate plant that afforded little opportunity for proper buying and warehousing practices.

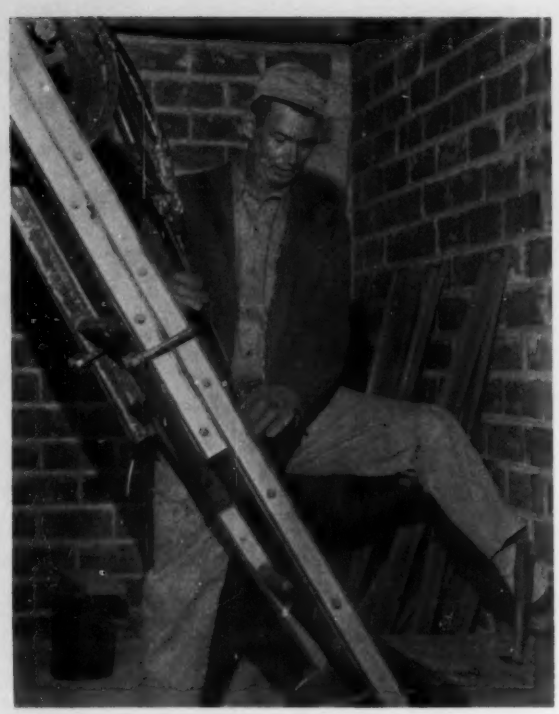
Necessity not luxury

Too often, tool purchases are thought of only as a luxury which can be afforded during periods of prosperity. Tool-buying programs are so conceived, often with sad results. The first few years of a tool's use may call for little replacement. However, as business grows, additional equipment is needed. This should be acquired as need arises and resources permit, rather than attempting to deny the need.

This system acts as a partial off-

(Continued on page 109)

This outdoor conduit rack, designed to permit loading from either side, consists of a welded pipe framework. It has resulted in savings.



Job superintendent Wayne Hutchens demonstrates use of power wire puller and power pipe saw. These are typical of power tools that have enabled Tom M. Brooks, Pampa, Texas, contractor, to reduce costs.

How power tools justify lower bids

By Bill G. Cox

This article should be especially helpful to the following readers:

Electrical Contractors ✔
Electric Utilities
Electrical Wholesalers ✔
Electrical Inspectors
Industrial Engineers
Consulting Engineers

◆ SEVERAL electrical contractors admit they have been puzzled by the low bidding on major jobs in the Amarillo, Texas area by Tom M. Brooks, Pampa electrical contractor.

Some contractors have told the aimable Brooks they don't see how he can break even, much less make a profit, on some of the big jobs his firm has received recently.

Brooks says the answer is simple enough and isn't a secret, either: time-saving tools, a workable tool-control system, up-to-the-minute bookkeeping, and timely merchandising. "I save hours and subsequently money," Brooks explains.

And he doesn't hide his light under a basket. "I welcome any contractor who would like to come check my shop," he says. "I'm always eager for an exchange of ideas. I seldom talk to another contractor that I don't learn something."

In October, Brooks Electric Company had six major jobs in excess of a half-million dollars working in Amarillo and Pampa. In fact, one reason Brooks is in the process of moving his general offices from Pampa to Amarillo is the big volume in the neighboring metropolis; another reason is the proximity of suppliers, architects, and engineers.

Brooks' Amarillo jobs include two hospital additions, a shopping center, a junior high school, and an elementary school.

One of these, a six-story plus penthouse addition to St. Anthony's Hospital, is one of the biggest—if not the biggest—electrical contracts ever let in the city's history, about $200,000. The job includes a 13.2 kv primary service that feeds a 100 kva three-phase transformer; a 100 kva standby generator; a combination switchboard and motor control center; a total of 300 hp air-conditioning motors; a nurse call system, doctors' wireless paging system; and dimmer switches in every room.

Besides the St. Anthony's job, Brooks' jobs include a $100,000 contract for a two-and-a-seven story addition to Northwest Texas Hospital; the complete wiring of the new David Crockett junior high school at about $100,000; the Fleetwood Shopping Center at about $35,000; and Mesa Verde Elementary school, at about $30,000. In Pampa, Brooks has the $100,000 contract for the Pampa Community Hotel, a 100-room motel-hotel building.

Here are two time-saving power

(Continued on page 107)

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NISA, Southwestern Chapter. Miss Ann Hickman, Secretary, Box 546, Fort Worth, Tex.

Training and maintenance essential to tool program

By T. H. McCullen
Service Dept. Sales Mgr.
Anderson and Cramer, Inc.
Arlington, Va.

This article should be especially helpful to the following readers:

Electrical Contractors ✔
Electric Utilities
Electrical Wholesalers ✔
Electrical Inspectors
Industrial Engineers
Consulting Engineers

◆ PROPER USE of the proper tool can make a job. The reverse is equally true—lack of either can break a job. The right tool handled skilfully can make a job profitable. However, if you have the right tool and misuse it, you undermine your profits, and may render a job unsafe as well.

We look upon tool control as tied in very closely with our safety program. Our system of charging tools to a job, training our mechanics and foremen in the use of tools, special and new tools, checking condition of tools coming in and going out, tool maintenance and repairs has been designed for deriving maximum benefit from our tool investment and as a safety measure for the protection of our personnel.

We have a $10,000 investment in tools, and 90 to 95 per cent of them are out in use most of the time. Our training program for our job foremen and job superintendent in tool operation places responsibility on them for seeing that tools are used correctly and skilfully.

A job foreman is also held responsible for reporting promptly any malfunctioning or damaged tool on a job. His report covers who was using it, name of tool, what it was being used for, how the damage occurred, what was broken, any injury, etc. Repair costs on a damaged tool are charged to the job on which the damage occurred.

A new and special tool bought for a job is placed in the hands of the general superintendent. Having studied the manual and received instruction from the manufacturer's representative, the general superintendent in turn instructs the foreman on the job where the tool is to be used.

The foreman, in turn, sees that a skilled mechanic knows its operation and can handle the tool with skill and confidence before it is left with him. Only our most skilled and responsible mechanics are entrusted with very expensive tools like a diamond core drill. This is a precision tool that would be very costly to repair or replace if mishandled.

How tools are charged

Tools are charged to the job for which it was bought. A special tool is purchased if the job pays at least one-third of the cost of the tool or piece of equipment. As an example, we were drilling a number of holes in the concrete floors of a five-story building and bought a diamond point core drilling machine for the purpose. We have since used the tool many times, and it has paid for itself three times over.

Another special tool we bought was a jetline gun for pulling nylon thread through conduit by air pressure. This was put to good use on a government project where we had very long runs of conduit.

We file a card for each tool listing on it name of tool, description, number, name of manufacturer or local representative that can make major repairs on the equipment, cost, and date it was bought. Then we list name of job, superintendent or foreman on job, date the tool was checked out, date checked in. If the tool is out being repaired, this information is entered in the same manner as above with date, costs, etc., what job it came from to be repaired so that it can be properly charged.

Of course no system is better than the employees who carry it

(Continued on page 106)

All tools are carefully checked for needed repairs. Here an expensive core drill gets an inspection.

Hydraulic pipe bender is one machine which has been profitable.

An electric pipe cutting machine for ½-in. to 2-in. conduit has saved considerable manhours on jobs.

Another valuable addition is this "electric mule" conduit threader.

THEN
..and NOW
Since 1950, Southwire has grown from 10,000 to 250,000 square feet—an independent wire and cable manufacturer with skilled manpower to match the most modern equipment available.
SOME THINGS NEVER CHANGE AT SOUTHWIRE

Sure, a fellow may have to walk a little farther from his car to the plant, or use the telephone to get information instead of stepping into the next office for it — but at heart we're still a small plant in a small town, waiting anxiously for each order and eagerly watching its progress through the mill with care and pride.

We're still Jim, and Jack, and Dave, and Pete—to our customers and to each other. The order for a thousand pounds of copper wire is still important to us. And it gets the same personal attention as one for a million and a half pounds of ACSR transmission cable.

True, constantly expanding product lines, larger and more modern facilities, and continuing research programs, are added reasons for doing business with SOUTHWIRE . . . but personal attention, dependable service, and quality products, are the things that have built our business and will continue to make SOUTHWIRE a good place to trade.

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• Bare and Weatherproof Copper and Aluminum Line Wire • Neoprene, Polyethylene, and VWP (Vinyl) Weatherproof Copper Aluminum and Triplex • U.R.D. (DBWP, TBWP) Copper • Copperweld® Conductors • Copper and Aluminum Building Wire • ACSR and All Aluminum Cable • Galvanized Steel Guy Strand and Static Wire • Aluminized Steel Guy Strand and Static Wire • Aluminum Alloy Wire • Cable Accessories • NM Sheathed Cable

ALSO FABRICATORS OF COPPER AND ALUMINUM FOR WIRE AND CABLE MANUFACTURERS

Distributor's sales meetings stress merchandising of motor control equipment

By Harry J. Miller

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities ✔
- Electrical Wholesalers ✔
- Electrical Inspectors ✔
- Industrial Engineers ✔
- Consulting Engineers ✔

◆ FOR SEVEN straight weeks, architects, purchasing agents, maintenance superintendents, plant engineers, electrical contractors and their personnel, and chief electricians from West Coast Florida's industrial establishments, rubbed elbows in the fixture-display room of the Electric Supply Company, in Tampa.

At each of the seven meetings held at this wholesale electrical firm, these electrically-interested people saw a vast array of motor controls the like of which has never before been shown in Florida, according to the company's Elbert W. Nasworthy, sparkplug of the show.

Held in conjunction with the Allen-Bradley Pageant of Control, the meetings were designed to show how wide and deep an assortment of motor control equipment could be obtained locally, without need for exasperating and time-wasting "special-order" requests. The distributor cleared his fixture-display room so the Allen-Bradley control board could be installed. More than 16 tons of equipments were shown, and these included over 200 items of control, varying from 6 volts to 440 volts and on up to include a high voltage 4,600-volt starter of 1,500 horsepower capacity, selling at $7,000.

According to Nasworthy, the weekly meetings enlightened electrical men as to the nature, extent, and variety of motor control available. The meetings also brought closer rapport among the members of the electrical industry charged with design, purchase, installation, and maintenance of motor control. In addition, these people, on a tour of the wholesaler's warehouse, got to see more of the wiring devices in a single meeting than they could have seen in a year's contact with jobber salesmen and manufacturers' catalogs.

C. A. Fields, of Electric Supply, lectures on reduced voltage starters at one of the meetings held by his company in Tampa, Fla.

At each meeting, two Allen-Bradley representatives were on hand to explain the function of the wide assortment of products on display. Since most of the speakers were representatives of the wholesaler, an air of informality predominated which encouraged those who attended to ask questions along the line of their own needs and interests.

The first meeting was attended by the electrical contractors and the personnel of Florida Power Corporation of the St. Petersburg and Clearwater area. The second meeting drew electrical men from Bradenton and Sarasota south to Fort Myers, while the third and fourth meetings saw an assemblage of purchasing agents, maintenance supervisors, and supervisory electrical personnel from this section of Tampa's industrials, comprising the packing and processing plants and canneries.

The fifth meeting was well attended by similar personnel from the industrials, packing houses, and phosphate mines in and

(Continued on page 106)

Architects, purchasing agents, maintenance superintendents, plant engineers, electrical contractors, and their personnel attended the very successful series of seven meetings on motor control equipment.

ALL NEW!

Now! A new "Super Tape" for cold weather and heavy-duty uses

"SCOTCH" Brand Electrical Tape No. 88 is an all new plastic electrical tape 20% thicker than ordinary plastic tapes. It was specially developed to be a "super" tape for the toughest jobs—is super conformable under all climatic conditions. Even in cold weather, the extremely stable plastic backing retains easy handling properties and feel; the high-tack adhesive sticks at a touch and grips firmly. And the extra-tough flame retardant backing provides excellent resistance to abrasion, puncture, flame, acids, alkalies, oil, and weathering. For complete information, just clip and mail the coupon.

Electrical Products Division

"SCOTCH" AND THE PLAID DESIGN ARE REGISTERED TRADEMARKS OF 3M CO., ST. PAUL 6, MINN. EXPORT: 99 PARK AVE., NEW YORK 17. CANADA: LONDON, ONTARIO.

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Please rush me complete information on your new cold-weather tape, "SCOTCH" Brand No. 88 Electrical Tape.

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CITY_____ ZONE____ STATE_____

Shaping our future--contractors' theme

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities ✔
- Electrical Wholesalers ✔
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers ✔

◆ A CONTRACTOR development program designed to increase the capacity of the electrical contracting industry so it can keep pace with its rapidly growing markets was presented to the Board of Governors of the National Electrical Contractors Association at its 58th annual convention held in Miami Beach, Fla., in November.

In outlining the program, which is based on a two-year field research study, NECA President Oliver F. Burnett said it was a bold and pioneering step in association service to an industry. He warned that unless this or some better plan is followed, the industry will drift into oblivion, "for to stand still is to die."

Mr. Burnett's remarks were based on a joint report of the NECA Marketing and Research Committees who proposed that this program involving a plan for self-improvement of contractor management capabilities and relying on selling effort as the principal means of earning business be made the dominant Association program.

Tremendous potential

The research disclosed that the potential demand for electrical contractor services is almost limitless. It measured the electrical craft market in terms of value of installed electrical materials, equipment, and apparatus at $14.4 billion annually. Electrical use, and consequently demand for contractor services, is doubling each ten years. The study showed that the contractors faced a challenge in developing their organizations to fill this booming need.

The Contractor Development Program proposes a self-appraisal by the contractor himself of his business methods, capacity, and attitudes. A self-appraisal chart has been developed to help him to do this job. Then, if he wishes to develop more, this NECA "do-it-yourself management consultant kit" gives him guides as to what to do.

To assist him, if he wishes help, workshop programs will be provided on the various management subjects he desires to use. This is a developing plan and the committees suggested that a logical course would be the establishment of not only the management workshop program but also a national institute of contractor development for the electrical industry.

Staff assignments have been made to prepare materials and methods to motivate contractors to do the self-appraisal as the first step. A brochure describing the program was presented to the Governors and the timetable calls for starting the workshops in February, 1960.

Program cost $190,000

The research underlying the program cost $190,000, and the committees stated that expenditures in that range were justified by developments in the economy. These were cited as changes in labor laws that weaken union influence in new construction markets and the need for contractors to develop business on their own initiative; the rapid expansion of the electrical industry, and the need of the U. S. businessman to exert his management capabilities to the utmost in the developing economic competition with the U.S.S.R.

In the latter connection, Mr. Burnett quoted the committee reports thus: "In recent weeks, the outline of the international struggle between the free competitive enterprise system and the controlled system of communism has been given to us in clear terms. Whether the Western concept of freedom and initiative of the individual or whether the domination of the state prevails will depend more upon the example and the results provided by individual U. S. business men and industries than upon missiles and atomic warheads. We must arm ourselves and we must do it ourselves. It is something we cannot look to Government to do for us."

High level illumination

The demand for new higher levels of lighting has placed before the electrical contractor the opportunity of providing the all-electric ceiling that not only will give light but a substantial part of the cooling in hot weather and the heating in cold weather.

This was the shape of a huge market Willard C. Brown, manager of lighting education for General Electric's Large Lamp Division at Nela Park, outlined to the convention.

To dramatize his point, Mr. Brown produced full Florida beach sunlight of 10,000 footcandles inside the Hotel Fontainebleau Auditorium. That was the first time light of such intensity has been developed outside of a laboratory.

The new higher levels of illumination have been incorporated into recommendations by the Illuminating Engineering Society. They are based on a seven year study by Dr. Richard Blackwell of the University of Michigan. These recommendations indicate that light needs for reading a well-printed book may not be as high as previously suggested, but most other visual tasks require about twice the previous recommendations.

For example, Mr. Brown pointed out that it takes a light level of about 500 footcandles—equal to the shade of a tree on a sunny day outdoors—to properly read handwritten notes or carbon copies. For some industrial tasks, the light needed runs into thousands of footcandles.

Fixture heat utilized

Mr. Brown stressed that care must be exercised in planning high level lighting installations and choosing fixtures to keep lighting easy on the eyes. Also he pointed out that increasing the amount of light also increases the amount of

heat. This heat can yield important benefits. He described a supermarket in the mid-west that utilizes heat from a high-level lighting system to provide 80 per cent of the store's winter heating requirements. In another instance, an office is 66 per cent heated by lighting fixtures. To take advantage of this, new lighting fixtures incorporating airflow control means have been developed and are already being installed.

This could mean an added bonus for the industry. With lighting taking over as much as 80 per cent of the winter heating load even today, the remainder of heat necessary could be practically supplied by electricity.

Mr. Brown said that the old faithful filament lamp has been recently improved to produce from 7 to 15 per cent more light. This can mean extra light for all American users worth more than $25 million a year. Fluorescent lamps are now being built that can produce 200 watts, and the new quartz lamps given even more light per watt, more lasting brightness, in smaller packages.

In the future, developments in electroluminescence promise more efficiency than any source known. Mr. Brown noted that in 1906 a worker with one footcandle, barely moonlight level, paid about 7.7 per cent of his wages for the light. Today, 200 footcandles cost only 3.4 per cent.

"With all of the advantages that better lighting brings," Mr. Brown said, "in most cases our customers cannot afford *not* to provide the new lighting levels."

Low bidding menace

The need for profit opportunities in proportion to services rendered and less reliance on price only as the basis for buying and selling construction services was emphasized by several speakers addressing the convention.

President-Elect Harold A. Webster said that the association must continue to educate non-members as well as members to "induce competitors to insist on a profit on every job." Pricing a competitor out of business is not a profitable venture, he advised. His remarks reflected the growing concern in the construction industry over what has been called a profitless prosperity caused by extremely low bidding that is resulting in a growing number of serious failures in the contracting field.

The second day's session featured marketing and public relations subjects, with F. E. Keith, Des Moines, chairman of the NECA Marketing Committee as the chairman of the day. John A. Derry, director of the Division of Construction and Supply of the U. S. Atomic Energy Commission, discussed federal construction procurement practices.

Panel discussions

The contracting-out issue was the subject of a panel discussion involving Vice-President Gerald A. Hadden, of the Consolidated Edison Co., of New York; John H. Lyons, Jr., vice-president of the International Association of Bridge, Structural and Ornamental Iron Workers, and two contractors, T. R. Armstrong, of Cincinnati, and Leo C. Witz, of Chicago. They discussed the problems involved and methods to promote the contract method of doing construction as opposed to the "do-it-yourself" way.

The role of contractor relations in making the contract system work was the subject of an address by John A. Volpe, of Malden, Mass., who has been nominated to be president of the Associated General Contractors next year. His discussion dealt with some of the critical procedural and ethical problems involved in prime-subcontractor relationships that are the cause of many instances of substandard construction performance.

The Utility Line Constructors held a special conference at which a new film, "Down the Line," showing the role of the line construction contractor, was presented. Discussion of problems in this specialty field took place after the film showing.

The principal feature of the third session was the presentation and discussion of the technical and training programs. NECA District Three vice-president, Carl Teal, of Birmingham, Ala., presided. The newly-revised National Electrical Code was the subject of a roundtable discussion led by W. H. Biester, Jr., of Philadelphia chairman of the NECA Codes and Standards Committee. His panel included Richard W. Osborn, of St. Louis; W. B. Whitaker, Underwriters Laboratories, New York, and Dewey Johnson, chief electrical inspector of Atlanta, Ga.

A roundtable discussion on reducing the problems arising from specifications was conducted by a panel that included Kenneth Priestly, Bridgeport, Conn.; J. Stewart Stein, president of the Construction Specifications Institute; William Tao, consulting engineer. St. Louis, Mo., and James D. Witherspoon, Westinghouse Electric Co., Pittsburgh.

Another roundtable discussion explored practical and technical aspects of higher intensity lighting. Panel members included Charles L. Bobe, St. Louis, Mo., Willard C. Smith, of General Electric Co., Nela Park; Edward J. Benesch, and Roy J. Tuttle, consulting engineers, New York; and Charles L. Amik, Day-Brite Lighting, Inc., of St. Louis, Mo.

A final panel on planning for adequate credit included Karl F. Stolting, Santa Rosa, Calif.; John A. Beck, Baltimore; Donald E. Denton, American Commercial Bank, Charlotte, N. C.; Harold Butt, electrical wholesaler, Charleston, S. C., and C. K. Shaw, Hartford, Conn.

The final business session was devoted to labor relations and included reports by W. J. Cour, NECA Labor Relations Director; Bill Damon of the National Joint Apprenticeship and Training Committee; and W. D. Howell, secretary of the National Electrical Employees Benefit Fund. A feature of this session will be a testimonial to Louis K. Comstock by E. C. Carlson, past president of NECA. Mr. Comstock, who is observing his 95th birthday, has contributed greatly to sound labor relations in the industry.

Shortcut methods

(Continued from page 28)

muscular manpower. By the same token the same hoist can put the same kind of heavy material back into the truck when needed for a contract job.

Another very simple but unthought-of idea in many other shops is Baldini's pipe racks. Ramsey Electric keeps a large stock of these pipe in stock for any ready need. They are all stacked on end instead of being laid horizontally like so much stacked lumber. They not only take up much less room this way but are more easily and quickly loaded on truck. Each set of pipes of a given size is stacked end-up in a partitioned off compartment to itself. No time lost in digging out any specific needed size.

Densheath 900 installation in a paper mill. The tough insulation on this new 600-volt wire makes it particularly suited for chemical plants, refineries, and paper mills.

FOR YOUR 600-VOLT INDUSTRIAL WIRING NEEDS...

ANACONDA DENSHEATH 900

OFFERS: LONG LIFE... HIGH HEAT- AND MOISTURE-RESISTANCE... CHEMICAL STABILITY... EASY INSTALLATION

And its multiple ratings give you an added advantage! Densheath* 900 retains its electrical and physical properties despite exposure to heat, moisture, cutting compounds, lubricants, most acids and alkalies. It has proved itself again and again—even in the most critical spots. It withstands rough handling without tearing or abrading. Densheath 900 is flexible and strips easily. It's easier to install.

Special heat-resistant insulation safely permits higher currents under exposure to higher ambient temperatures than is possible with ordinary PVC thermoplastic materials.

As a result, Densheath 900 is approved not only for use as TW... but also for machine-tool applications and 90 C appliance wiring. These multiple ratings make one stock possible, eliminating the need to carry separate inventories of each type of wire.

For full information, or to order, call the Man from Anaconda or your Anaconda distributor. Also—write for descriptive bulletin DM-5612. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

*Reg. U.S. Pat. Off. 59203

ASK THE MAN FROM

ANACONDA®

FOR DENSHEATH 900 WIRE

UTILITY ENGINEERING

Transmission — Distribution — Metering

Design
Installation

Testing
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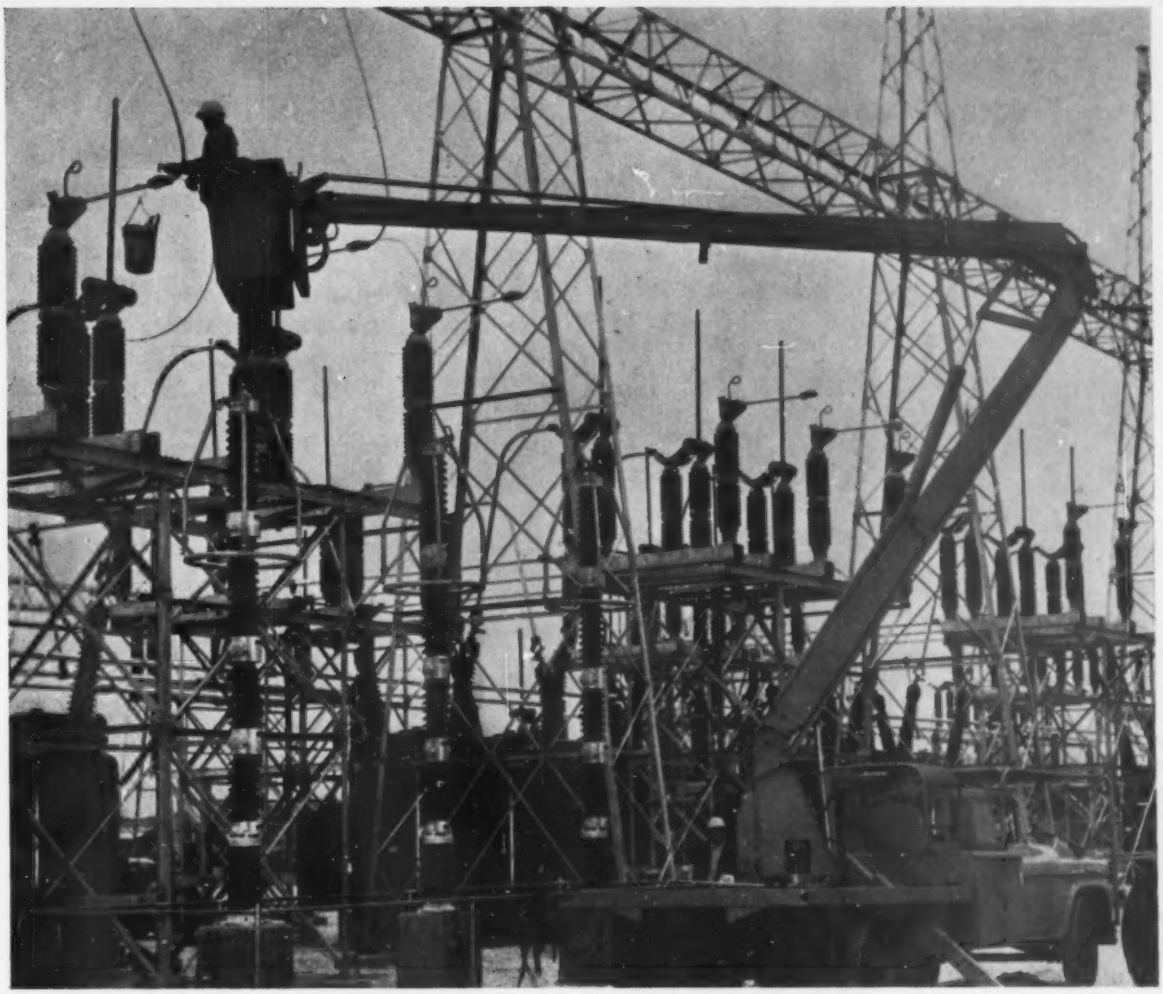
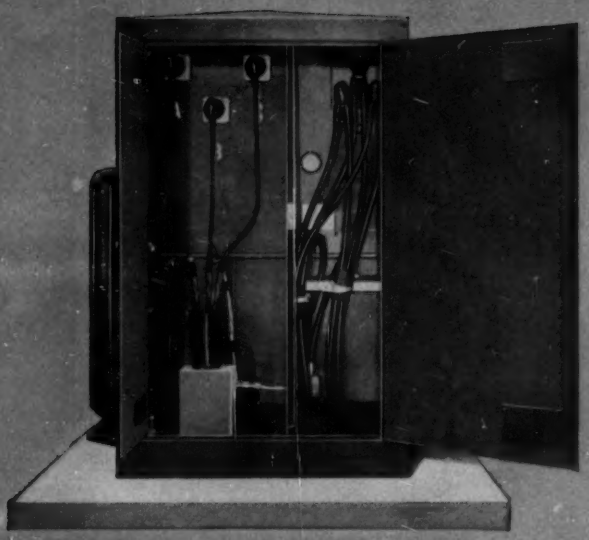


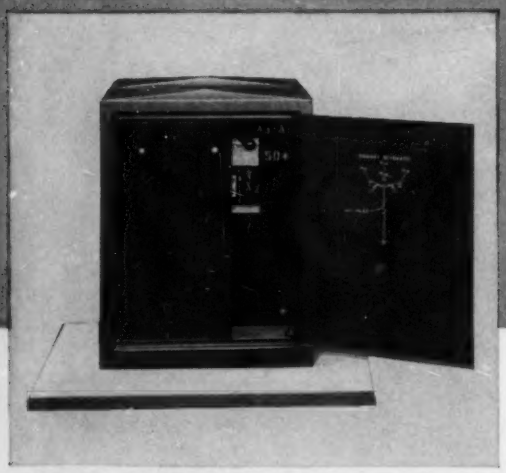
Substantial savings are being made through use of aerial lifts—see page 44

Field testing of transformer oil—page 48
Capacitors used to limit station surge voltages—page 50
Line routes surveyed electronically—page 52
Fuel cells get practical power application—page 54
New marketing concept: systems, not components—page 56



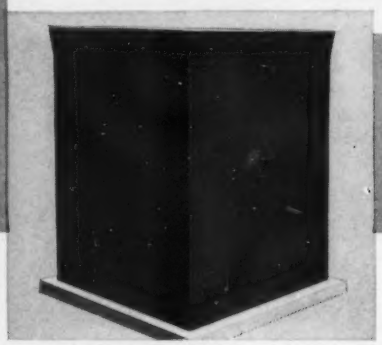
SINGLE-PHASE 50-kva, 12,470 grounded wye/7,200 volt L-M Pad-Mount Transformer. Photo shows the primary compartment at left, with oil switch and standoff insulator. At right is secondary compartment, with insulating barrier separating it from primary section. Shown are secondary bushings, breaker, signal light, and emergency control. At bottom of primary compartment are studs for mounting lightning arresters if desired. Primary compartment is covered with separate panel.

LINEMAN is about to close and lock door. Note panel over primary compartment, and the neat, compact appearance of the unit, which makes it ideal for residential subdivisions, where shrubbery can hide it completely.

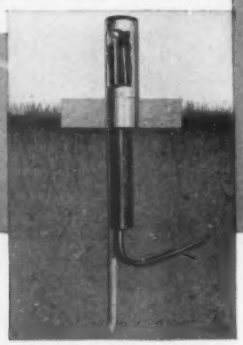


THIS 300 kva, 12,000 volt three-phase unit is installed at a small industrial plant. Note that the primary compartment is closed for safety when work is being done on the secondary.

OTHER NEW L-M UNDERGROUND DISTRIBUTION EQUIPMENT



L-M TRANSCLOSURE(TM), a convenient, multi-size, rainproof, ventilated steel housing for pole-type distribution transformers, protective equipment, reclosers, load transfer equipment, etc. Provides above-ground accessibility for underground services.



L-M POWER PEDESTAL, for above-ground connections of buried secondary services. Removable dome; raintight; tamperproof, with provision for padlock. Ask L-M Field Engineer or write for bulletin on styles available.

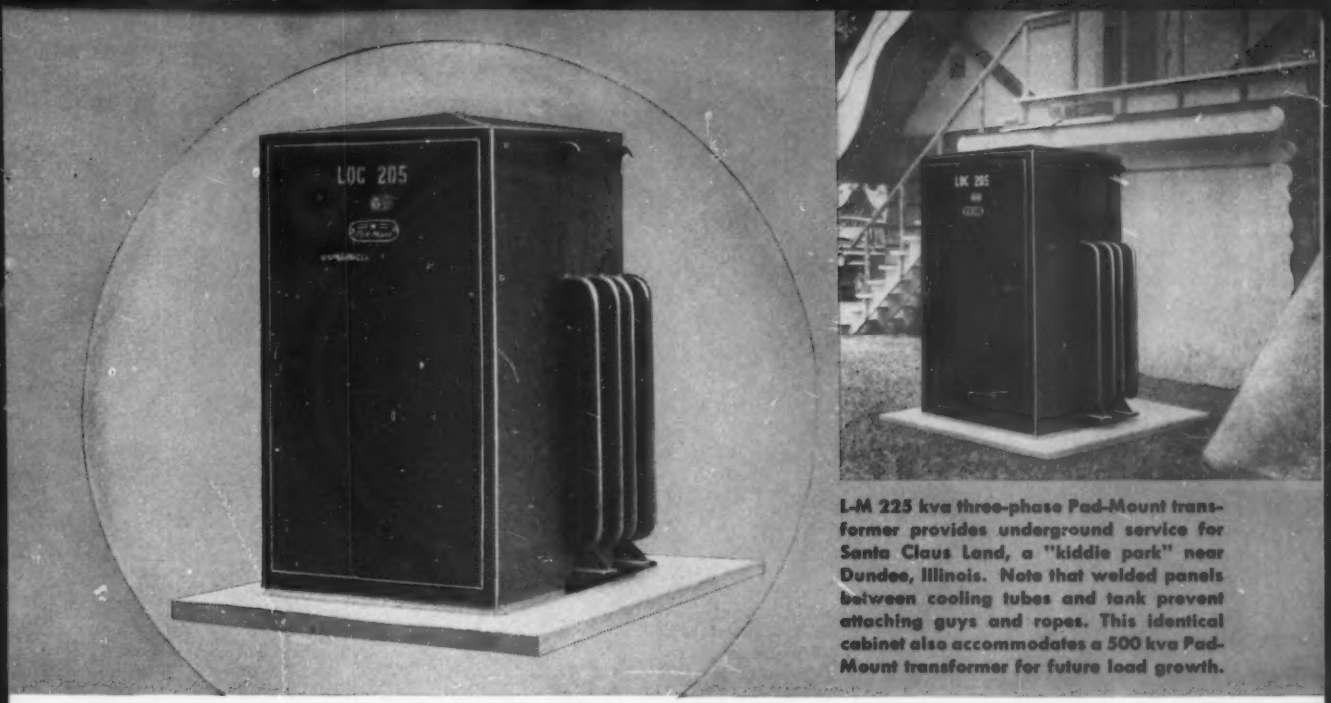
THIS TRUCKLOAD of L-M Pad-Mount Transformers is part of a 68-unit order being installed at a large trailer court in the Middle West. Quantity production and delivery like this have enabled L-M to make drastic reductions in the cost of this specialized, highly efficient transformer.

406

Nothing Else Like It!

The L-M Pad-Mount Transformer is available in single-phase through 167 kva, and three-phase through 500 kva in all distribution voltages.

Get complete information on how the LM Pad-Mount Transformer will help you simplify *your* underground construction problems. Ask the L-M Field Engineer for Bulletin DT8. Or write me at Line Material Industries, Milwaukee 1, Wisconsin.



L-M 225 kva three-phase Pad-Mount transformer provides underground service for Santa Claus Land, a "kiddie park" near Dundee, Illinois. Note that welded panels between cooling tubes and tank prevent attaching guys and ropes. This identical cabinet also accommodates a 500 kva Pad-Mount transformer for future load growth.

New L-M Pad-Mount Transformers Are Practical For Underground Distribution

Developed by L-M in cooperation with engineers of major utilities to meet specific requirements for underground distribution systems. Provide advantages not available in other types.

By A. R. WAEHNER
Director of Transformer Sales
Line Material Industries

Economical underground distribution is a vital topic of study and discussion today by leading system-planning engineers. Recognizing the future developments, load-growth opportunities, and other factors placing pressure on utilities, Line Material has cooperated with utilities to develop equipment that will help make underground distribution simpler, more efficient, and more economical to install and maintain.

L-M's Outstanding Development... One of the leading developments from this extensive cooperative research is the Line Material Pad-Mount Transformer. This outstanding unit has already been thoroughly tested. It is used by a number of utilities, including one of the largest in the country, where it has been in operation for about two years. It is proving highly successful, primarily because the design has been progressively developed to take full advantage of the opportunities afforded by newer, simpler methods of underground construction.

Conventional or Self-Protected... The L-M Pad-Mount Transformer is of Round-Wound® design, available in either conventional or self-protected, in single- or three-phase, in a tank specially designed for ground-level or roof-top mounting. A locked door covers the primary and secondary bushings. It can be completely hot-stick operated. There is an oil switch in the primary. A stand-off insulator for primary leads, mounted in the cabinet but not on the transformer, permits taking the transformer out of service when desired.

Compartmental Design... The compartments are so arranged that the primary section is completely isolated with a barrier of insulating material. This prevents access to the primary when working the secondary side. Door has rust-proof stainless-steel piano hinge.

No De-Rating with This Unit... The de-rating conventionally applied to transformers in buried or semi-buried vaults is not necessary, because the L-M Pad-Mount is a free-standing, above-ground unit, which takes full advantage of air circulation.

Volume Results in Cost Reduction... The original cost of this highly specialized, highly efficient unit apparently would be much more than even the most refined of the buried devices. However, volume production has enabled L-M to make drastic cost reductions. The L-M Pad-Mount is an extremely economical unit to buy and install in comparison with other systems.

Easy to Install... Installation is extremely simple. All that is needed is a concrete pad, with primary and secondary services brought up through fibre conduit. The bushings are so located that no sharp bends are made in the cable, thus assuring full life for the cable.

The cabinet may be separately shipped, mounted, and wired when underground services are installed in a subdivision. The transformer may be shipped later and easily attached to the compartment with four bolts.

LINE MATERIAL® Industries
McGRAW-EDISON COMPANY
McGRAW EDISON

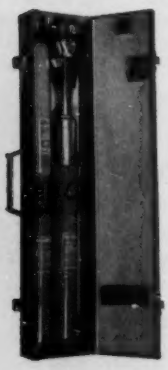
Underground Distribution Equipment

NEW THUMB OPERATED CRIMPER

LEAVES ONE HAND FREE to handle conductor!

The new Chance CO_2 Compression Tool is operated with one hand, leaving the other hand free to position conductor and sleeve. Its replaceable CO_2 cylinder provides the power. With no more exertion than a press of the thumb, your lineman can crimp aluminum connectors and line taps.

The tool is simple to use, mistake-proof. A safety key locks the trigger. When ready to crimp the connector, pull the key, place the head of the tool over the sleeve, align it with the crimp marks, and squeeze the trigger. The tool will make a correct crimp, automatically, every time.



Made of heat-treated steel and aluminum, this light, well-balanced crimping tool handles any service connector or tap that uses ½", ¾", or C dies. All three sizes fit this one tool. The dies are easy to attach, and automatically seat themselves.

The tool can perform 50 to 70 operations before the CO_2 is exhausted. Empty cylinders can be replaced in seconds. They may be refilled at local CO_2 dealers, fire extinguisher services, or your own refill station. The tool needs only simple maintenance. Light oiling will keep it in tip-top shape.

So, make it easy for your linemen to make connections correctly . . . **get the new Chance Compression Crimping Tool for service connections. We've given it Catalog Number CA-800. It, and two extra CO_2 cylinders, come packaged in a sturdy metal box. Ask your Chance Sales Representative for the whole story, or write us.**

CT59-27A

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ABC INDUSTRIES

KRALOY...

FIRST PVC RIGID CONDUIT INSPECTED AND PASSED BY UNDERWRITERS LABORATORIES!

Only KRALOY, yes *only* KRALOY, among all plastic conduits, now carries U-L listing—another first for KRALOY! High impact KRALOY PVC (Polyvinyl Chloride) RIGID CONDUIT... the *lifetime* conduit... the *perfect* conduit... won't rust, won't pit, won't corrode, won't support combustion, is non-magnetic and non-sparking. KRALOY needs no paint, no coating, needs no lining, and its mirror-smooth inside wall makes fishing easier than with any other type of conduit. Add these outstanding features to KRALOY's extreme light weight (see chart below) and you have the *ideal* conduit... ideal for direct burial and slab work. Installation costs can be cut *drastically* with light weight KRALOY PVC RIGID CONDUIT. Consider the dollars to be saved in handling and installing U-L listed KRALOY CONDUIT Cat. No. KE-1058 versus steel, *versus even aluminum conduit:*

KRALOY PVC CONDUIT is sold only through wholesale electrical supply houses.

NOTE WEIGHT COMPARISON — KRALOY PVC vs. ALUMINUM vs. STEEL CONDUIT

U.L. required minimum weight per 100 ft. including couplings, lbs.

K-59-29

Trade Size	½"	¾"	1"	1¼"	1½"	2"	2½"	3"	3½"	4"	5"	6"
KRALOY PVC	15.0	20.0	29.0	40.0	47.0	63.0	101.0	131.0	159.0	187.0	253.0	326.0
ALUMINUM	27.4	36.4	53.0	69.6	86.2	115.7	182.5	238.9	287.7	340.0	465.4	612.9
STEEL	79.0	105.0	153.0	201.0	249.0	334.0	527.0	690.0	831.0	982.0	1334.0	1771.0

For complete information on KRALOY PVC CONDUIT and installation directions, mail the coupon or write to **Kraloy Plastic Pipe Co., Inc., 4720 East Washington Blvd., Dept. ES-12, Los Angeles 22, Calif.**

NO CONDUIT REPLACES **KRALOY**

Kraloy Plastic Pipe Co., Inc., Dept. ES-12
4720 East Washington Blvd., Los Angeles 22, Calif.

Gentlemen: Please send me your new Brochure on KRALOY PVC CONDUIT which gives complete information and installation directions.

Name_____

Address_____

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Aerial lifts increase line labor productivity

Fig. 1—Typical elbow-boom aerial lift featuring two-man basket.

By K. S. Field
General Engineer
Ebasco Services, Inc.
New York, N.Y.

◆ THIS COMPANY is coordinating among 10 electric utility companies* an exchange of information on mechanized equipment and improved methods for distribution and low voltage transmission lines with the objectives of:

1. Reducing labor unit costs, or, in other words, increasing crew productivity.
2. Making line work safer and easier, and
3. Utilizing the experience of older linemen at the work they know best, whose knees and backs have given out to the point where they can no longer stay in the hooks.

Now, right here let me say I am not trying to sell one manufacturer's equipment as against another's. In so far as selection of equipment for your individual company's needs is concerned, you are the best qualified for making such selections. Nor do I profess to be an authority on the mechanics of automotive construction equipment; that is not my job.

There is one thing about which I am sure. If you are not familiar with equipment now available, and, where applicable, if you are not using such equipment to the fullest possible extent, then your company is missing a chance to effect real labor savings. Sure, the equipment costs a lot of money, but the carrying charges for such equipment are more than offset by reductions possible in crew sizes —that's the point we have to get across to those who control the purse strings when we are making up our budgets.

Advantages of aerial lifts

What are the advantages to be obtained by using aerial lift devices? Briefly they are (1) substantial economies in manpower and time, (2) reduction in accident hazards, (3) use of the experience of the older linemen at the work they know, after they can no longer continue climbing because of age, resulting in improved employee relations, and (4) better work done particularly where midspans and tree trimming work is involved. It is basic that wherever you can work with a line or ladder truck you also can work with an aerial lift device.

There is nothing new about the idea of using aerial lift working platforms in line work. Such equipment has been available for years. Most of you have such equipment in service on your properties. Some of the earlier types were crude and not too safe. Unfortunately, some serious accidents resulted from their use. Improved equipment now available has overcome most of the justified past objections. Generally speaking, today's modern equipment is reliable when properly used. Manufacturers solicit your suggestions which will make their equipment even more useful and safer to meet your needs.

With initiative, regardless of the extent to which you now are using aerial devices, I am sure you can find additional use for them on your properties, particularly in distribution, low voltage transmission, and substation work.

It has been said that in the last 15 years the labor-material ratio associated with transmission and distribution construction, operation and maintenance has shifted from a 40/60 per cent ratio to a 65/35 per cent ratio. Whether or not these figures hold for your individual companies I do not know, but we know that labor costs have snowballed. We all are concerned with finding ways of getting increased crew productivity. Additional mechanized equipment and improved methods appear to be the solution.

I think the areas for aerial lift devices offering the greatest prom-

*The companies participating in this exchange of ideas are Baltimore Gas and Electric, West Penn Power, Dayton Power and Light, Public Service Company of Colorado, Southern California Edison, Arizona Public Service, Texas Electric Service, Louisiana Power and Light, Carolina Power and Light, and Duke Power.

Fig. 2—Tree clearance work is ideal assignment for aerial lifts.

Fig. 3—Another type of lift in use.

ise for economies in man-hours and time are (1) tree trimming, and (2) maintenance and small construction jobs of a maintenance nature, as distinguished from major line and substation construction.

Lifts suited to line work

There are four basically different types of aerial lift equipment particularly suited to overhead line work. They are:

1. The hydraulic vertical lift square or rectangle platform, in use for many years
2. The hydraulic swing-type extension boom platform, which can be pivoted to facilitate access to work
3. The expansion-type platform, which can be extended to increased size as required
4. The insulated elbow-boom hydraulic lift with insulated platform or baskets of the Pitman, Holan or Skyworker types.

The hydraulic vertical lift platform is a carry-over from the old type platform used for street railway trolley wire maintenance. This particular piece of equipment is used by several companies for street light relamping and maintenance.

Another item of interest is the electrically operated extension boom 1-man platform known as the Telsta. It is manufactured in Oakland, California. The boom is operated electrically by an in-

Fig. 4—Double basket type well suited to handling long brackets.

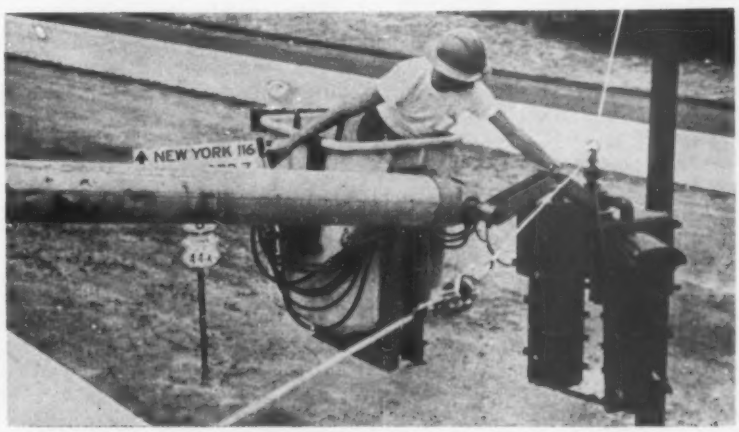


Fig. 5—Bracket on boom hoists and positions signal light on cable.

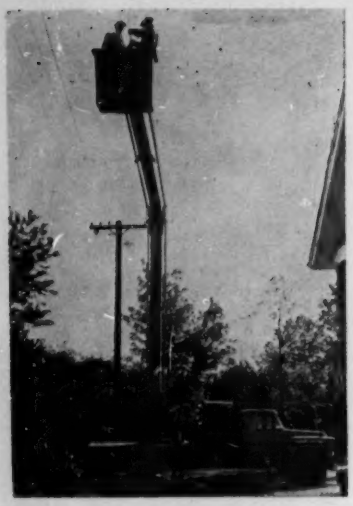


Fig. 6—Two-man crew makes a mid-span conductor repair.

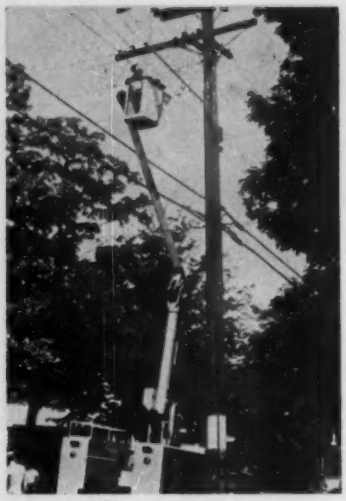


Fig. 7—Insulated basket minimizes hazard on outrigged construction.

Fig. 8—Transformer clamped to basket is raised into position.

genious dead-man control device. It is particularly suited for street light relamping and telephone aerial work where it will not be in energized conductors. The boom is so counter-balanced that it can be extended full length at any height from ground to maximum raised level. The boom pivots nearly 360° horizontally. Hydraulic outrig jacks or stabilizers are not required. The platform retracts into driver's cab making it possible to use a 1-man crew. Both Southern California Edison and Public Service Company of Colorado use Telsta equipment on their street light maintenance program.

Another hydraulic lift, extension platform was developed by Mitchell Maintenance Co., of Muncie, Ind., for street light maintenance work. The platform, in raised position, extends several feet to right or left of truck. This equipment cannot be purchased. It can be leased. Designed particularly for relamping and fixture washing, there are one detergent and two rinsing tanks and an electrical drying rack in the panel truck. By properly coordinating platform design with truck chassis, the manufacturer has eliminated the need for hydraulic outrig stabilizers or jacks. A 2-man crew is used with this equipment. Lamps are changed, and the glassware is washed and dried on an average of 2 minutes per lamp including travel time between lamp locations.

The latest in elbow-boom aerial lifts is shown in Figure 1. This happens to be the Pitman Manufacturing Company unit with fibre glass upper boom and laminated fibre glass 2-man basket. Holan, Skyworker, and other manufacturers make similar equipment.

This type of elbow-boom lift is particularly suited for many types of line and substation construction and maintenance work. The upper boom of fibre glass has been tested at 100 000 volts. It is obtainable in height from 40 to 60 feet, and at 1000-pound loading has a safety factor of four or higher. The lower boom can be equipped for sheave block and winch cable for raising poles or transformers. Ultimately, I think this type of equipment will replace the hydraulic A-frame now used on most modern line trucks.

Substantial savings recorded

Before discussing some specific work being done with aerial devices, I'd like to touch briefly on savings which might be expected to accrue, and on crew sizes. Actually in talking about the cost of equipment, should we not be talking about the annual carrying charges for having a piece of equipment rather than talking about its initial purchase cost?

Here are some reliable figures given to me by Texas Electric Service Company last January. Similar data are available from other operating companies and manufacturers. In early March, 1957, TESCO bought a Pitman "giraffe." Any other manufacturer's equipment of that type would have resulted in the same economies. A careful record of 1,800 jobs was kept in the remaining 9 months of 1957. Excluding travel time between jobs, the on-job costs for these 1,800 jobs was $6,700 and represented 714 crew hours. The crew consisted of a working foreman, a 63-year-old lineman, and a groundman. Conservative estimates for the same work by conventional crews approximated 1,256 crew hours at a cost of $15,900.

The saving with the "giraffe" and a three-man crew approximated $9,000 which might be extended on a 12 months' basis to $12,000. Capitalizing this saving at 20 per cent indicates that some $60,000 could have been borrowed for the purchase of equipment of this type through actual savings realized on use of one piece equipment. Another way of looking at that $12,000 saving might be that the saving is equivalent at least to the annual salaries of 2 first-class linemen. TESCO now has units in most of its operating divisions.

Experience indicates that increased crew efficiency will not necessarily materialize just by equipping a crew with aerial lift trucks. It requires initiative to find uses for this type of equipment. Personnel should be selected who have initiative and a desire to find ways of using the equipment. I have seen cases where the equipment has failed economic expectations because of improper selection

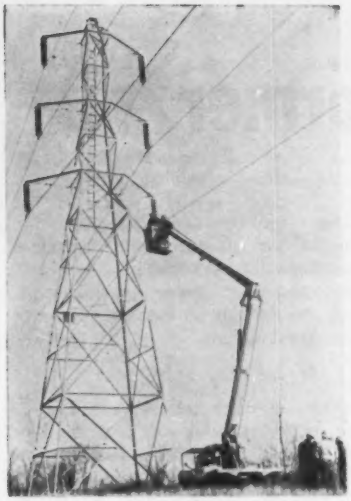


Fig. 9—Broken bell on suspension string is replaced from lift.

Fig. 10—With more and more aerial cable being used, the aerial lifts will greatly simplify the job of making mid-span splices.

of assigned personnel.

In considering the use of aerial lift equipment, we become involved with the problem of crew size. The degree to which crew size can be reduced depends to a great extent on terms and conditions in your labor contracts. Crew size for a piece of aerial lift equipment will depend upon the type of work to be done by the crew. I can think of very little justification for having more than 3 men on such piece of equipment. In many cases only 1 man will be required. Analysis of job requirements will show the optimum crew size you will need. I doubt if any "rule of thumb" guide for determining crew size can be developed.

Today aerial lift equipment is available in heights up to approximately 90 feet. Most elbow-boom lifts of the Pitman, Holan, and other reliable manufacturers range from 40- to 60-foot vertical boom length. These lengths will satisfy most requirements.

In earlier models of aerial lifts there were some sad experiences. Lifting linkages broke. Serious accidents resulted. Hydraulic outrig stabilizers or jacks were not always suitably coordinated with boom heights. Reilable manufacturers have overcome these faults.

If anyone asked me what phases of line work I thought offered the greatest promise of economies by using aerial devices, I would suggest periodic tree trimming, and street light relamping and glass-

(Continued on page 105)

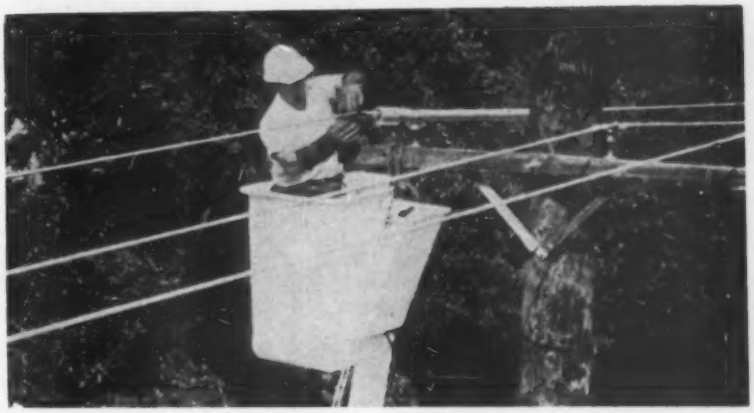


Fig. 11—Replacement of broken insulators and other similar types of maintenance work can be expedited by use of aerial lifts.

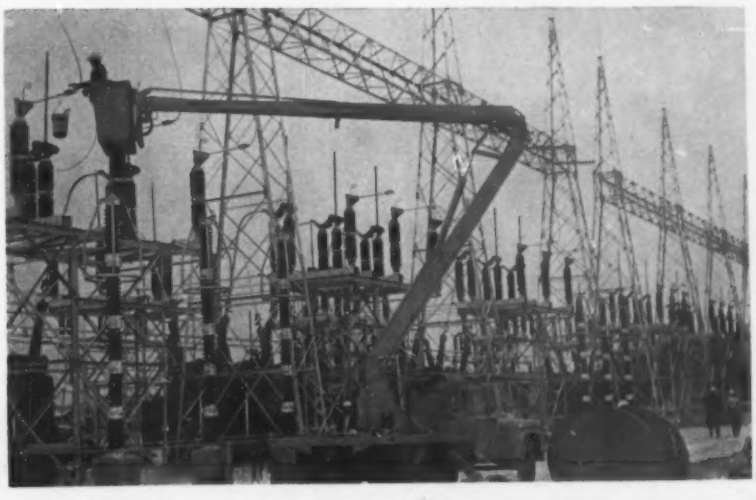


Fig. 12—Substation construction and maintenance also will offer many opportunities for effective use of elbow-boom type of lifts.

Field testing of transformer oil

By C. T. Bradburn* and R. E. Reinhard*

Allis-Chalmers Mfg. Co.
Milwaukee, Wis.

◆ SUBSTANTIAL interest has been shown in two recently developed field "spot" tests that can be used to evaluate transformer oil. These tests are the acidity spot test and the polar contaminant test.

The tests can be performed easily, quickly and accurately, by non-technical personnel following minimal instruction using a small, compact and portable test kit shown in Figure 1. Laboratory equipment and technical personnel are not required. Since the tests are basically "go—no-go" the results are definite, and can be readily and correctly interpreted without previous technical instruction or experience.

If transformer oil deteriorates, or becomes oxidized during use, acids and sludge are formed. Sludge may deposit on coil conductors or in oil passages causing elevated insulation temperatures which will greatly accelerate the aging of the insulation. Acids may chemically attack the components of the unit in addition to reducing the dielectric strength of the oil.

These detrimental effects can be prevented if the deterioration of the oil is detected and treated or removed from the apparatus before the oxidation of the oil reaches a harmful level. Easily conducted field tests to detect the danger point of oil deterioration should be of value to electrical maintenance personnel. The acidity spot test and polar contaminant test are similar in method, and are described below.

Acidity spot test

The acidity spot test indicates the acid number of transformer oils. Acid number indicates the amount of acidity in the oil and is defined as the number of milligrams of potassium hydroxide (KOH) required to neutralize one gram of an oil sample.

To perform the acidity spot test, a piece of filter paper is placed on a holder and three drops of acidity buffer are placed on the center of the filter paper. When the filter paper has absorbed the buffer solution, two drops of the oil sample are added in the center of the

*Mr. Bradburn is associated with the Transformer Dept.; Mr. Reinhard, the Research Laboratories of Allis-Chalmers Mfg. Co.

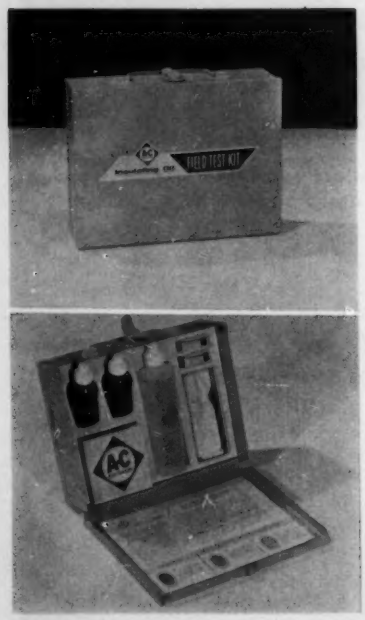


Fig. 1—Open and closed views of the simple insulating oil field test kit which permits easy checking of oil condition. Trend toward dangerous conditions are found before danger point is reached.

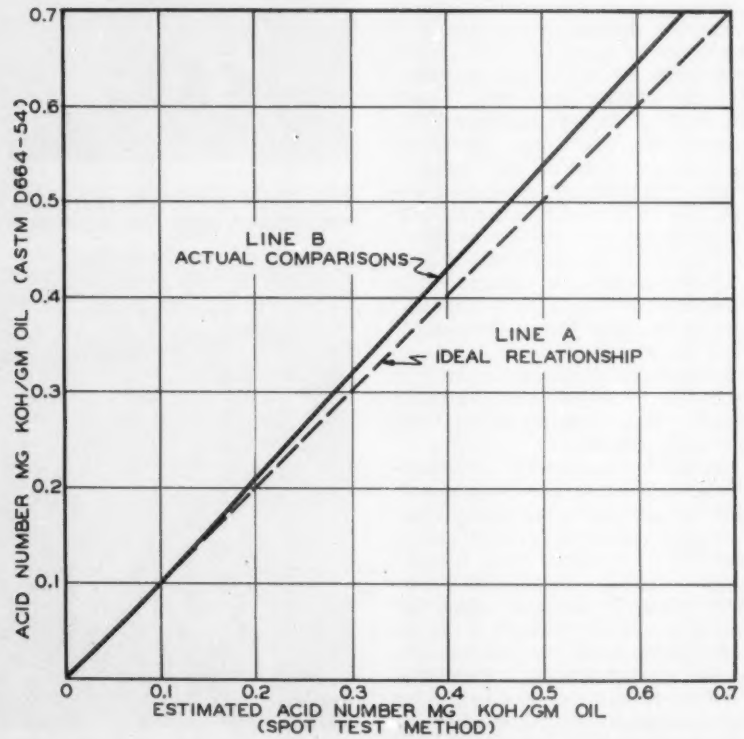


Fig. 2—These curves show comparison between tests made by standard neutralization number and acidity spot tests made with the kit.

buffer spot. As soon as the oil is absorbed by the filter paper, one drop of acidity indicator is placed in the center of the oil spot.

The acidity indicator will undergo a color change as it soaks into the oil spot. It will take on a light green color with a wide blue border if the oil has very low acidity content (for example, acid number of 0.01).

The color will be bright chartreuse (equally-yellow-green) for oil having acid content just under that usually associated with sludging (acid number of 0.3).

The spot color will be a more yellow than green if the acidity content of the oil sample is high enough to be dangerous to the apparatus. (A bright yellow spot is typical for 0.5 acid number.

An oil sample of extreme acidity content would have an immediate pink colored test spot.

The acid number of an oil sample may be obtained by visually comparing the color of its test spot with the colors of standard spots produced by oils of known acid number. A comparison chart containing standard colored spots is provided in the kit. Acid numbers between 0.01 and 0.50 can be estimated quite accurately if enough standard colored spots are available and these limits may be considered the useful range for this test.

Fig. 3—Typical indications of polar compound spot test made with kit.

(Left) Spot smoother than standard—oil is low in polar compound content. The spot shown is typical for interfacial tension of 45 dynes/cm. (Center) Standard spot for polar compound test—polar compound content is just sufficient to decrease the interfacial tension of the oil to 18 dynes/cm. (Right) Spot rougher than standard—polar compound content is high. The spot shown is typical of an interfacial tension of 15 dynes/cm.

It was established in early investigations of this type of test, that although temperature and relative humidity slightly affected the intensity of the color of the colored spots obtained, the acid number determinations were not affected.

Many comparison checks of oil samples with acid numbers up to 0.8 were made between the acidity spot test and the results obtained from the standard neutralization number test (ASTM Standard D-664-54). The results of the comparisons between these two tests are graphically shown by Figure 2.

The ideal, exact relationship would be designated by a straight line A having a 1:1 slope ratio. Line B represents the results of comparisons actually obtained from the many comparison checks which were made. It will be seen that if the spot test shows an acid number of 0.5 the results from the standard test (ASTM Standard D664-54) on the same oil sample would show an acid number well within 0.1 of this 0.5 value. Accuracy of this degree is adequate for this type of test.

An acid number in excess of 0.3 is readily and easily detected by comparing the test spot color with the standard color reference. It is generally agreed that oil with an acid number in excess of 0.3 is certainly suspect and an immediate full laboratory test should be made of this oil to further determine the exact amount the oil has degenerated and to plan corrective action.

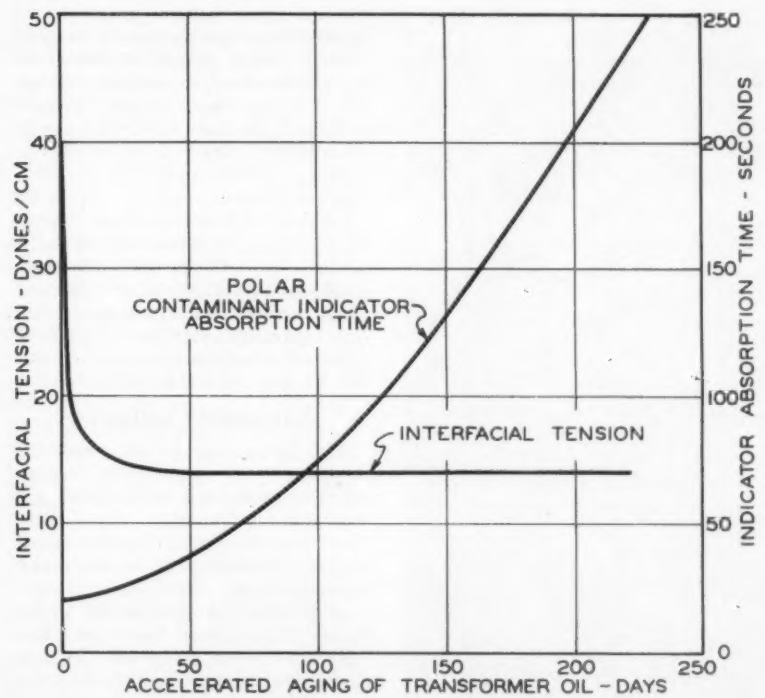


Fig. 4—Comparison of methods for checking oil for polar contaminants. Polar indication absorption time shows promise of being more useful measurement of polar contaminants than interfacial tension.

Polar contaminant test

Polar contaminants as referred to are peroxides, aldehydes, organic acids, and other products formed when mineral oils are oxidized. The presence and amounts of these undesirable contaminants are usually determined by an interfacial tension test.

The polar contaminant test is performed by placing three drops of the oil to be tested on a piece of filter paper supported by a holder and allowing it to soak in. Then

(Continued on page 104)

Capacitors limit surge voltages

By Herman B. Wolf
Manager of Operations
Duke Power Company
Charlotte, N. C.

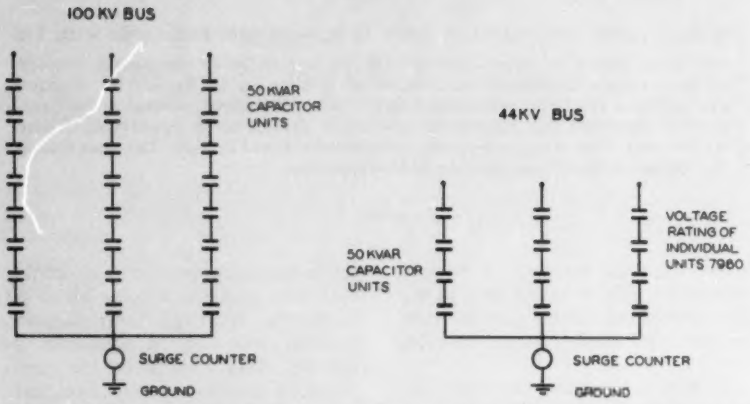


Fig. 1—Schematic diagram of 100 kv and 44 kv capacitor installations designed to limit surge voltages and protect substation equipment.

TABLE I

SUMMARY OF VOLTAGES IN SUBSTATION

100-KV SUBSTATION
MAGNITUDE OF INCOMING SURGE - 700 KV
WAVE SHAPE OF INCOMING SURGE - 0 x 20 MICROSECOND WAVE

50 KVAR, 7980 VOLT CAPACITORS PER PHASE		TOTAL CAPACITANCE PER PHASE (MICROFARADS)	TIME TO CREST VOLTAGE (MICROSECONDS)	CREST VOLTAGE (KV)
NO IN SERIES	NO OF PARALLEL STRINGS			
8	1	0.261	51.4	237
8	2	0.522	66.3	141
8	3	0.783	75.8	101
8	4	1.044	82.8	79

44-KV SUBSTATION
MAGNITUDE OF INCOMING SURGE - 350 KV
WAVE SHAPE OF INCOMING SURGE - 0 x 20 MICROSECOND WAVE

4	1	0.522	66.3	70
4	2	1.044	82.8	40
4	3	1.566	93.2	28
4	4	2.09	100.6	21

TABLE II

COMPARISON OF ARRESTER AND CAPACITOR SURGE COUNTER READINGS FROM DATE OF INSTALLATION TO SEPTEMBER 1, 1959

	LOCATION	DATE INSTALLED	CAPACITORS 1958	CAPACITORS 1959	ARRESTERS 1958	ARRESTERS 1959
100 KV	CONCORD	6-14-58	127	79	0	0
100 KV	PINNACLE	6-20-58	287	185	0	0
44 KV	LINDEN ST	5-25-58	84	213	0	0
44 KV	OLD FORT	9-7-58	7	132	0	0

◆ THIS PROGRESS REPORT presents information and data on four substations installations of capacitors connected between the substation bus and ground to provide surge protection for bus and connected apparatus. One purpose of the test is to determine capacitance required to absorb energy of an incoming surge so as to reduce the peak voltage to a tolerable value. Application of the idea of absorbing surge energy of a traveling wave from a transmission circuit appears to be practical now because capacitor units rated 50 kvar and 100 kvar are available.

The ability to absorb a surge varies with the amount of capacitance, or rating of capacitors, in the circuit to ground. For the purpose of these tests, a single series of 50 kvar capacitor units is used from phase to ground which gives a certain reduction in crest voltage of the incoming surge. Should further reduction in crest voltage be required, larger units, or two or more capacitor units in parallel, may be used.

Table I shows the crest voltage which may be expected on both 100 kv and 44 kv buses with a single series of 50 kvar capacitor units and then with two, three, and four parallel strings. Figure 1 shows a schematic diagram of the 100 kv and 44 kv installations.

Advantages indicated

The advantages of capacitor protection for substation equipment as compared to arresters appear to be as follows:

(1) Instantaneous response to all surges regardless of wave shape or magnitude.

(2) Protection is assured at all times. As current flows continuously in the capacitor circuit, this flow may be monitored continuously or checked periodically.

(3) Complete protection is provided when capacitor assembly is equipped with backup gaps which

will function in case of a direct stroke to the station, or in case of a direct stroke to a line in close proximity to the station.

(4) Capacitors are not damaged by switching surges. However, it is recognized that capacitors will not limit the voltage rise occasioned by a long wave as effectively as the shorter lightning surges.

The effectiveness of the 100 kv test installations is indicated by the maximum crest value of only 237 kv when a 700 kv 0x20 microsecond wave is applied to the transmission line as shown by curve in Figure 2.

In order to obtain as much experience as possible in the shortest time, these four installations were placed on station buses having a single incoming line to a transformer bank—a point of maximum reflection. In each case the line is over 20 miles in length.

To determine the effectiveness of the capacitors as protective devices, a modern station type lightning arrester was installed at each location, in parallel with the capacitor installation, with a surge counter installed in the ground circuit of the capacitor neutral and in the ground circuit of each arrester. Figure 3 shows a schematic diagram of the test installations.

The performance of the test installations is shown in Table II. Counter readings include period from date of installation to Sept. 1, 1959. Figure 4 shows views of the test installations.

Economic considerations

The economics of this type of protection seems to be somewhat as follows: the cost of capacitors and racks as used in the four installations was somewhat higher than the cost of station type arresters; however, if credit is given for the application of this amount of capacitance to the system, then the cost may be comparable to, or lower than, the cost of arresters.

In conclusion, these tests are being conducted to explore the possibility of improving surge protection for station equipment. Comments and suggestions will be welcomed and data will be gladly furnished to others wishing to continue or extend this investigation.

We acknowledge with thanks assistance given by both General Electric Company and Westinghouse Corporation in providing data relating to this subject. We especially acknowledge assistance given by J. M. Clayton, of Westinghouse Electric Corp.

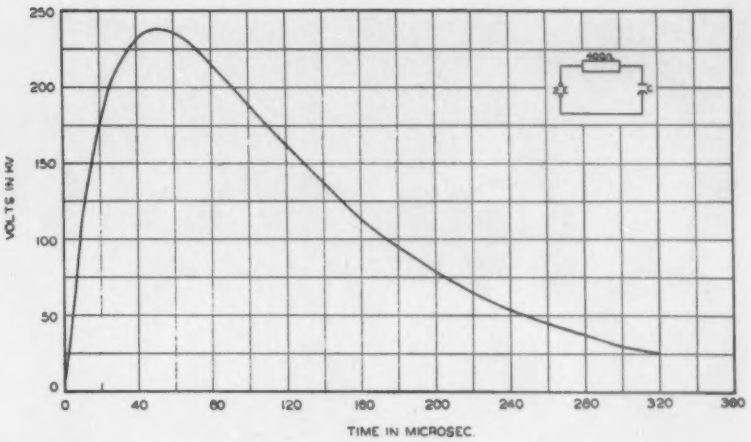


Fig. 2—On the 100 kv test installation, the application of a 700 kv 0X20 microsecond wave produced a maximum crest value of only 237 kv.

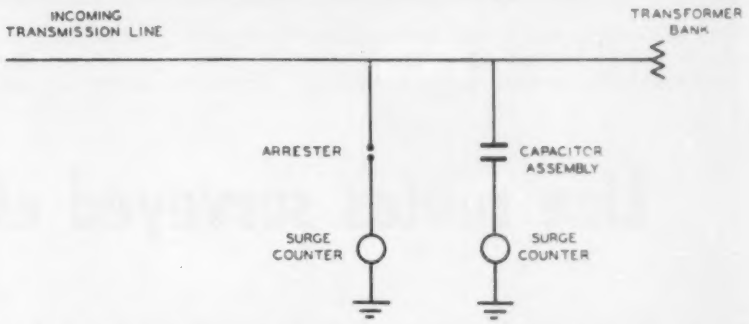


Fig. 3—Schematic of test installations in 44 and 100 kv substations.

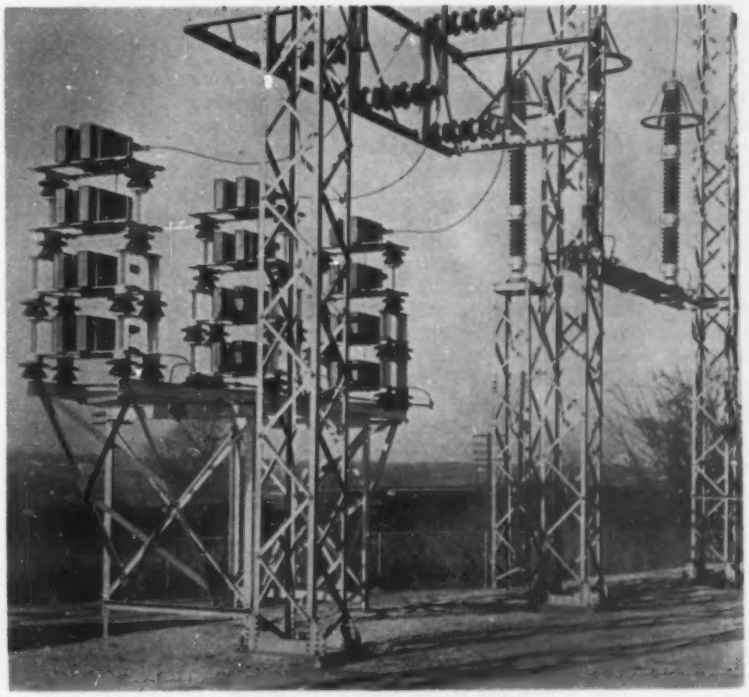
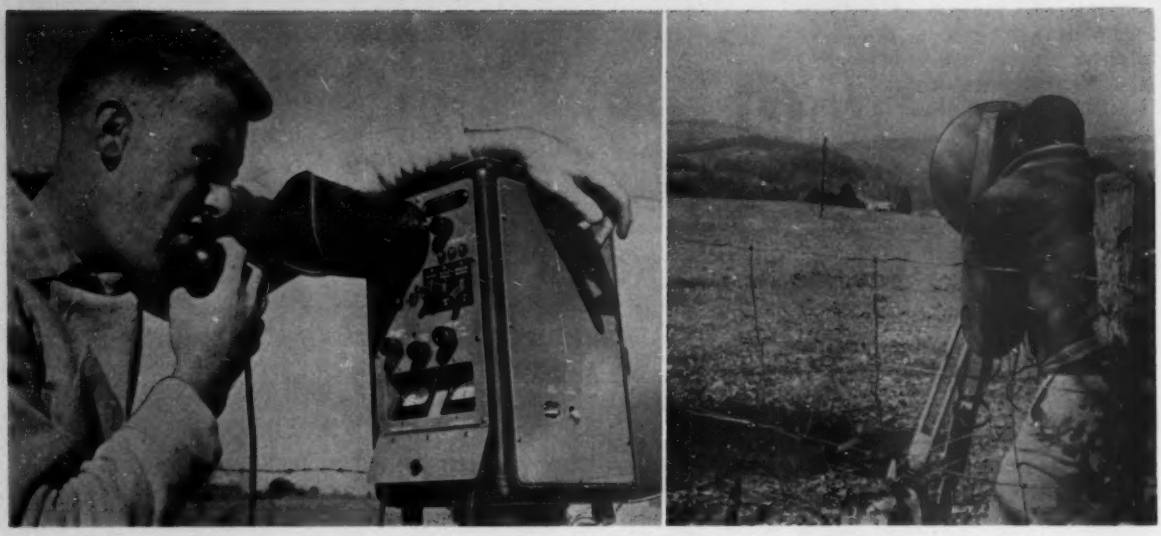


Fig. 4—Typical surge protective capacitor bank in 100 kv substation.



The two components of the "Tellurometer"—an electronic system for surveying—are shown here in actual operation. A small radar transmitter, at right, sends microwaves to a distant receiver such as that shown at left. The time it takes the radar waves to travel out and back is converted into distance.

Line routes surveyed electronically

◆ UTILITY ENGINEERS have applied a new surveying technique for the first time to transmission line surveys and produced significant savings in time and costs.

On two assignments, recently, the engineering department of Potomac Edison Co., Hagerstown, Md., approved use of the new "Tellurometer" system for establishing horizontal control preparatory to mapping a band of terrain for location purposes. The electronic distance-measuring device enabled the surveyors in both instances to complete their jobs in a fraction of the time which traditional taping or triangulation methods would have required.

On one project, Potomac Edison wanted to determine location for a 26-mile transmission line between Frederick, Md., and Millville, W. Va. The company called in Air Survey Corp., of Arlington, Virginia, to survey the route, put in the necessary control points, and map it. The photogrammetry firm proposed to produce the specified contour by aerial photogrammetric methods. Before the route could be flown and photographed from the air, however, it was necessary to establish a number of strategic controls along the line, points of known elevation and distance from each other.

By traditional methods, a survey party would have actually taped the distance between "stations" on the ground. Considering that the line crossed three high mountains and the Potomac River, this method would have taken weeks. An alternate method called triangulation would have required the party to establish a wide network of points, to measure the angles and then compute the distance between points geometrically.

Air Survey Corporation decided instead to try a new electronic instrument called a Tellurometer System which measures distances directly by means of high-speed micro-waves. With this radar-like device, they hoped to shoot across the Potomac and from high point to high point down the 26-mile line instead of either chaining on the ground or triangulating.

Time saved is considerable

The experiment proved highly successful. The Potomac Edison project required the establishment of 10 pairs of intervisible horizontal control points through the band to be mapped. An Air Survey Corporation survey party of three men completed this assignment in 10 days. Traditional methods would have taken five men at least 30 days, the mapping firm estimated.

The measurements were accurate to one part in 15,000, the surveyors found, well in excess of that specified for the location map.

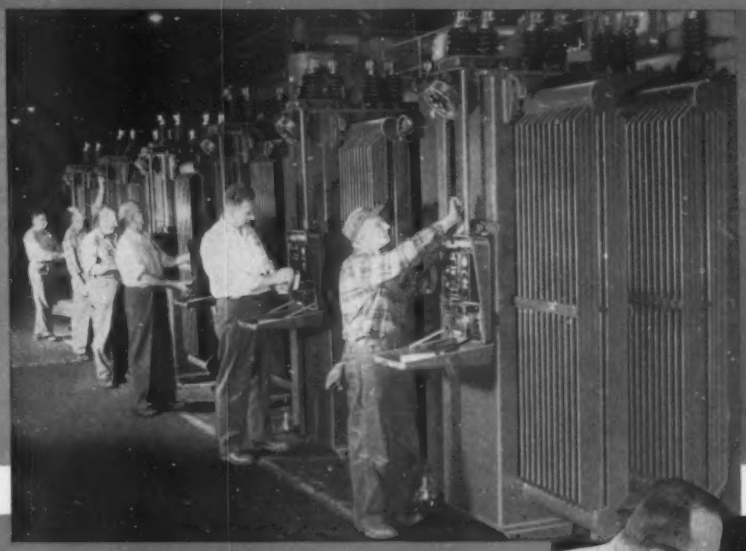
The manufacturer of the Tellurometer claimed the system is capable of measuring distances from 500 feet to 40 miles. The longest "shot" on the Potomac Edison job was 103,440.15 feet (slightly more than 19½ miles).

On a second assignment, also for location mapping purposes, similar savings were realized with the Tellurometer. Although this was not through mountainous terrain as the first assignment was, it was unusual in another aspect. Using the Tellurometer off one high position overlooking the Shenandoah Valley, the Air Survey crew was able to establish almost all the control points required along the 27-mile route of another proposed transmission line.

Eight pairs of control points were needed for the valley route. Almost all were established with the Tellurometer master on the one

(Continued on page 104)

ALLIS-CHALMERS... Pacing Power Progress



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Fuel cells get practical power application

◆ A NEW SOURCE of electrical power—fuel cells which convert fuel gases directly into electrical energy—has come out of the laboratory to power a vehicle. Applied now on an experimental basis to a tractor, the fuel cells of the future may provide electric power for homes, factories, trucks and buses, or even for military weapons or space vehicles.

A fuel cell powered tractor was demonstrated recently by Allis-Chalmers Manufacturing Co. The research vehicle develops at least 3,000 pounds of drawbar pull, enough to pull a multile-bottom plow.

"Although our experimental fuel cell tractor is of commercial size." says Dr. H. K. Ihrig, director of research and a vice-president of the company, "it still is a research vehicle."

The electricity that drives the tractor comes from 1,008 individual fuel cells. These are joined in 112 units of nine cells each. The 112 units are arranged in four banks and electricity can be taken from any combination of the banks.

A mixture of gases—largely propane—fuels the cells. The gases are fed into the cells through a system of tubing and, once in the cells, the gases react in an electrolyte. A catalyst coating the electrodes of each cell aids the reaction.

The chemical reactions within the cells cause a direct current to flow through an external circuit which is connected by bus bar to a standard controller. The compact controller, measuring 8 by 11 by 21 inches, regulates the electricity supplied to a standard 20-horsepower d-c motor.

The controller permits the tractor driver to regulate speed or reverse the tractor's direction by moving two levers. Using the speed control, the operator places the four banks of cells in series or parallel, varying the amount of current going to the motor.

To reverse the tractor, the driver moves the second lever, changing the polarity of the current flow to the motor.

In field tests, the tractor pulled a two-bottom plow through dry, hard ground.

The tractor carries its gas supply in tanks mounted in brackets on the vehicle.

Allis-Chalmers Research Division developed the prototype of the fuel cells used in the tractor. The company announced its fuel cell a little more than a year ago.

Since then, researchers have developed the larger, more efficient fuel cells shown today. A team of about 20 engineering scientists in

A mixture of fuel gases—largely propane—and oxygen react in an electrolyte within 1,008 fuel cells to provide the electricity that powers this experimental Allis-Chalmers tractor. The controller to the left of the driver controls the engineless tractor's speed and direction.

How the Allis-Chalmers fuel cell operates

The fuel cell instantaneously converts chemical energy to lectrical energy—direct current. The chemical energy is in a mixture of fuel gases—largely propane. In the fuel cell, the mixture of fuel gases is fed to the anode electrode and adsorbed by the catalyst on the electrode. It is activated there and reacts in the electrolyte. This reaction releases a stream of electrons (direct current).

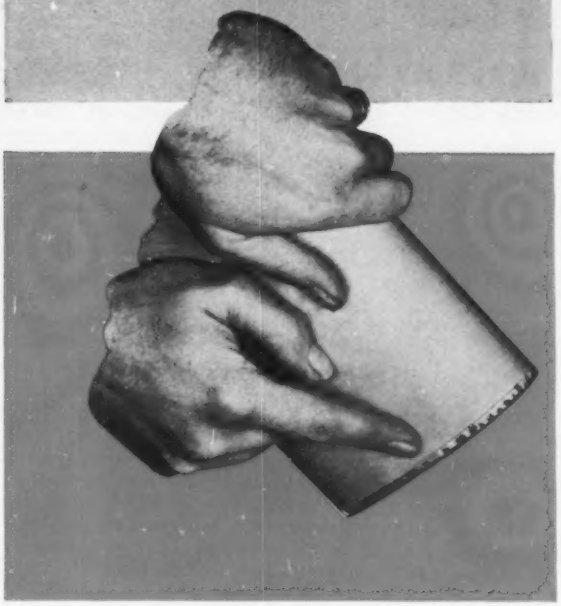
Meantime, oxygen is adsorbed at the cathode electrode and it reacts with an electron from the external circuit and with the electrolyte, thus reforming the ion which was used up at the anode electrode. The over-all reaction is the consumption of the fuel gases to yield water and carbon dioxide and to produce a flow of electrons (direct current) through the external circuit.

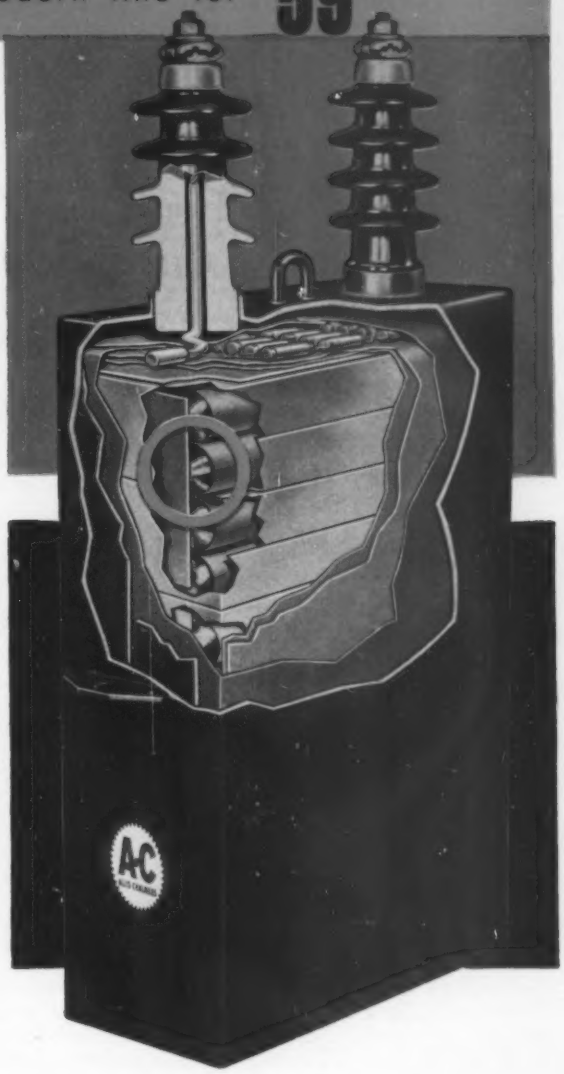
Details of the specific application to the tractor are as follows: number of fuel cells—1,008; fuel cell dimensions—one-quarter inch thick, 12 inches square; fuel cell voltage—approximately one volt open circuit; total electrical output—15 kilowatts; fuel gas used—a mixture of gases, largely propane; type of motor—standard Allis-Chalmers 20-horsepower d-c; tractive power—3,000 pounds at drawbar on dynamometer; tractor weight—5,270 pounds.

ALLIS-CHALMERS modern line for '59

EXTENDED-FOIL COOLING...

- reduces hot-spot temperatures
- lengthens service life





New Allis-Chalmers Power-Factor Capacitors

Allis-Chalmers extends aluminum foil *beyond* the ends of each capacitor pack to speed heat dissipation to container sides. Result: *substantial reduction* in hot-spot temperature over ordinary capacitor designs!

And electrical contact is also improved. Broad spring-pressure contact plates press against the long edges of each foil. Losses are minimized; low current density results. Your bonus: extra years of faithful capacitor life . . . extra protection against transient overcurrent induced by lightning, switching surges or capacitor-discharge through nearby line faults.

Capacitor Facts Fast! Call, wire or write...

ALLIS-CHALMERS

A-1188-E

the research laboratories built the larger version of the Allis-Chalmers fuel cell installed in the tractor. They also modified a standard Allis-Chalmers D-12 tractor and put the cells in it.

Research scientists and engineers in a number of large companies are now looking to the fuel cell as a more efficient method of converting chemical energy to electric energy.

As a device which provides direct current power, the fuel cell resembles other electric cells but has a considerably higher efficiency. Like all batteries, it consists essentially of electrodes and an electrolyte. Conventional storage cells, however, have their energy stored in the electrode-electrolyte system within the cell, whereas the fuel cell can store no energy within the cell itself. It instantaneously converts chemical energy to electric energy. A fuel, such as hydrogen, supplied from an external source can furnish this chemical energy. In theory, a fuel cell can supply electric power as long as the fuel supply lasts. In the past, fuel cell performance left much to be desired because of the difficulties associated chiefly with unfavorable chemical reaction rates.

What was probably the first fuel cell was described by Sir William Grove in 1839. The cell operated on hydrogen and oxygen. Fifty years later, in 1889, particularly good results were reported by Ludwig Mond and Charles Langer, who obtained a relatively high current density of six amperes per square foot with essentially the same type cell. In

(Continued on page 104)

New marketing concept features systems instead of components

◆ ELECTRICAL manufacturers must develop "new marketing concepts" to further the economic growth of the nation, James H. Jewell, vice-president in charge of marketing for the Westinghouse Electric Corporation, said recently.

Speaking before members of the American Marketing Association, Mr. Jewell predicted that these new selling techniques will play a vital role in attaining "future security, prosperity" for the United States.

One example he cited was the sale of "systems" instead of "pieces." He pointed out that generators, transformers, switchgear, and other electrical apparatus have been sold as individual components in the past.

"We have left it to the utilities to buy these components and to put them together like erector sets," Mr. Jewell said. "This method is no longer adequate. In the future we are going to furnish more than components. We are going to help them design and build power systems."

"We have already made dramatic progress toward this objective. Our engineers have devised a method of building a mathematical model of any power system and setting it up on a computer. Once this has been done, 20 years of operating experience can be gained in 20 minutes."

"The mathematical model can take into account all the variables the utility management cannot now cope with, and come up with answers that actually take the risk out of these critical investment decisions."

Mr. Jewell said that the "marketing of systems" will begin to dominate the electrical and other industries in the next ten years. "In other words," he continued, "we are going to be marketing engineering skill and scientific resources along with our traditional hardware."

Explaining that the trend has already begun in the industrial market, Mr. Jewell described a control unit which automatically operates a giant cold rolling mill for a steel corporation. He added that a single supplier furnished all of the components for the control unit which actually "cost 25 per cent more than the mill itself."

Mr. Jewell traced the development of the "systems" concept in marketing to defense products. He also credited military research and development with being largely responsible for the electronic industry as it is known today.

"Military systems whether they be for detection or communications or control are inevitably electronic," he said. "More and more the trend is to think of the electrical and electronic industries as one and the same. And we find them merging in every phase of our industry."

In discussing consumer products which, he said, account for 38 per cent of the total electrical products market, Mr. Jewell described product planning as one of the most important ways for a manufacturer to secure a strong competitive position.

Westinghouse has assigned a marketing team to coordinate research and new product development work with the "needs of our customers and their changing values," he said. Under this team's supervision, he explained, another group of marketing and research people makes an annual visit to every division of the company.

"Last year this team returned from its tour with ideas for 640 new products," Mr. Jewell said. "Thirty of them were picked for the 1959 development program."

The Westinghouse vice-president also described improvements that are being made "to cut costs and improve service" in the physical distribution system of Westinghouse. When an order is received for a stocked item such as refrigerators at the company's Kansas Appliance Sales office, the information is carried on the "biggest industrial teletype network now in service," he said.

A huge computer in Columbus, Ohio, then decides which is the best location from which to make a shipment, provides for shipping documents and customer invoices, and produces billing and cost distribution figures, Mr. Jewell said.

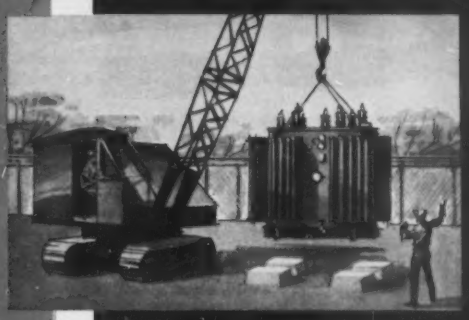
"It's an expensive system, but well worth the investment," he continued. "in fact, experience to date indicates that it pays for itself by eliminating pricing mistakes alone."

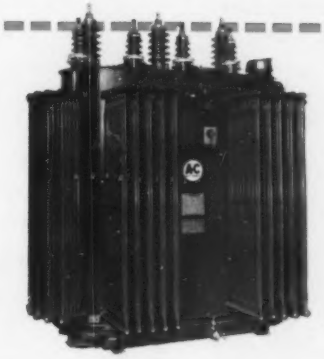
"It permits us to reduce regional inventories; solves communication problems between sales, shipping and divisional points; keeps the right products in the right distribution channels; and promotes better distributor relations."

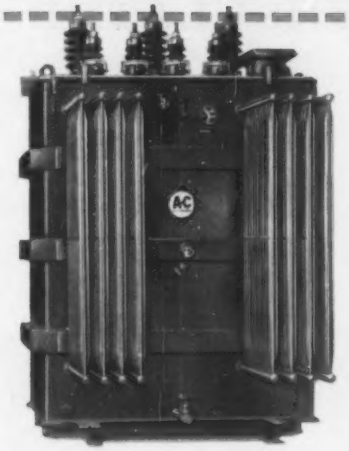
Mr. Jewell conclued that "data processing equipment and modern communications will revolutionize our physical distribution systems for stock items and this will become a major area for cutting the cost of delivered goods."

ALLIS-CHALMERS... Pacing Power Progress

Installs for less on pier, plank or pad...







New Allis-Chalmers small power transformers

Lighter! Lower! by 30%

Installation charges slashed! That's the start of the story for these new-design A-C power transformers. Their "hide-away" compactness and lighter weight add up to big savings in handling and pad costs. (The 34.5-kv, 3750-kva transformer, for example, weighs 8000 lbs. less than its predecessor.)

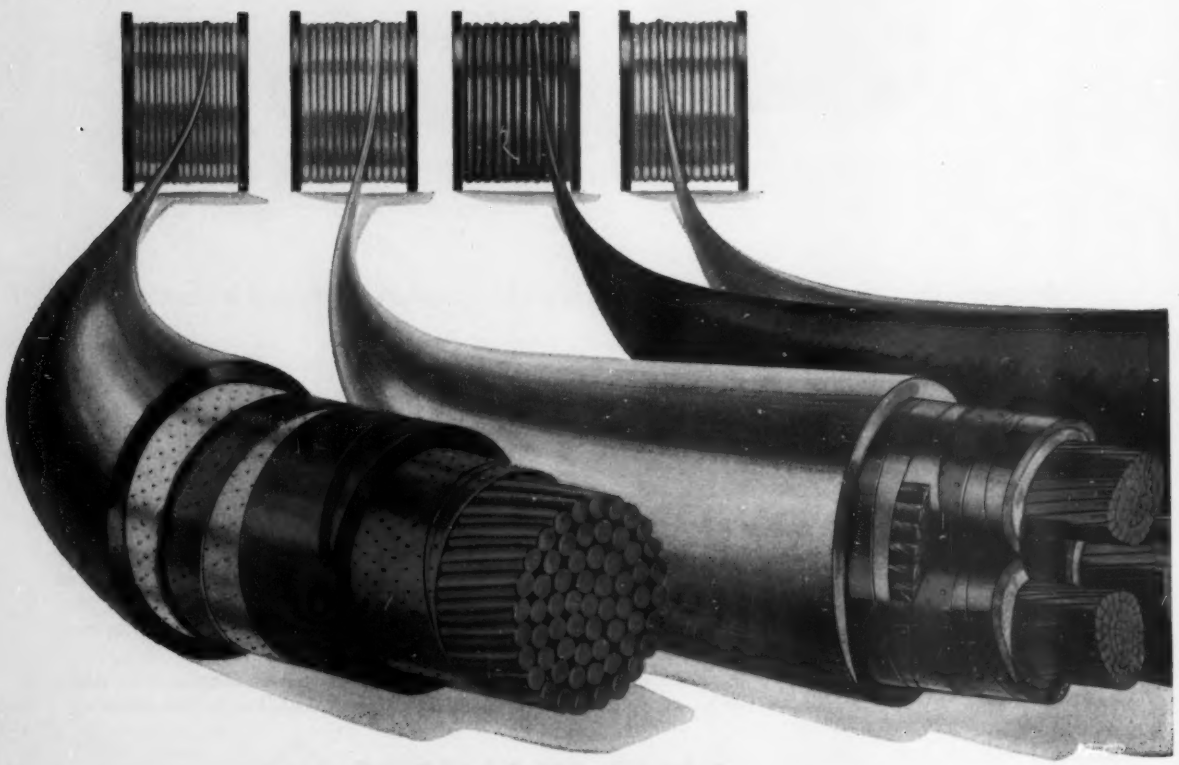
New design reduces losses, exciting current and noise level. Instruments are grouped for operator convenience. Servicing ease is assured by such features as a base sump, which collects and removes contaminants from active oil, and the built-in drain which permits sampling at the very bottom.

Get the complete story from your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS A-1180-E

FOR THE MOST EFFICIENT
POWER DISTRIBUTION . . . SPECIFY

PAPER-INSULATED CABLES BY PHELPS



Single conductor, 1 KV and up

Three-conductor, 1 KV and up

DODGE!

Phelps Dodge paper-insulated power cables have a *demonstrated record* of long life in a great variety of designs for all types of applications—underground duct, direct burial, submarine and aerial.

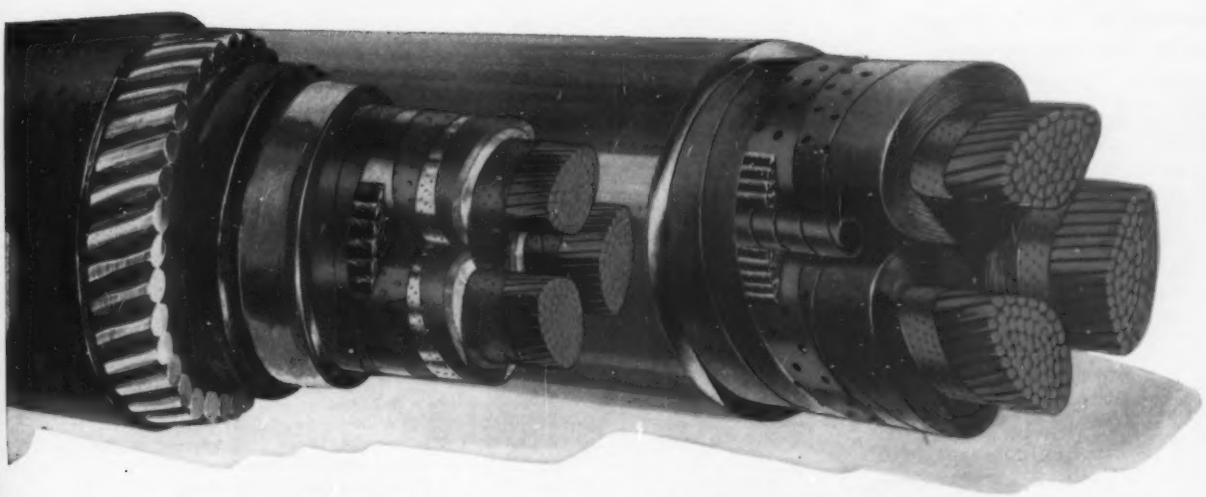
Paper-insulated cables have these important inherent characteristics that improve operating performance and lengthen service life:

- Extra high 60-cycle and impulse strength to withstand switching and lightning surges.
- Ability to handle large blocks of power in single cables of minimum dimensions.
- Positive protection against all contaminations, due to being hermetically sealed in an extruded metallic sheath.

Paper-insulated cables can be supplied with either lead or aluminum sheaths.

Phelps Dodge offers the widest range of high voltage cables to the electrical industry.

PHELPS DODGE COPPER PRODUCTS
CORPORATION
300 PARK AVENUE, NEW YORK 22, NEW YORK



Submarine, 1 KV and up

Low-Pressure gas-filled, 8 KV and up

Notes on new utility equipment

One-hand compression tool powers service tap crimps

THE A. B. CHANCE CO. Centralia, Mo., is now offering a CO_2-powered, one-hand-operated compression tool for service taps and service-entrance connections.

Jaws of the tool are activated by a lever tripped with the thumb of the tool-holding hand. Thus the operator has one hand completely free to position the conductor and the compression sleeve.

Nine tons of pressure is applied with each crimp. Power is furnished

by carbon dioxide gas stored in liquid form in a cylinder that screws into the handle of the tool. Over 50 crimps can be made with a single cylinder. Cylinders can be refilled at fire-extinguisher services, CO_2 dealers, or utility refill stations.

Safety features include a safety locking pin to prevent accidental operating of jaws, a safety blowout disk to prevent excessive pressure in the cylinder.

Write U-1201 on reply card, Pg. 11

Load break lever's 5:1 ratio breaks links faster, safer

STRENGTH to break even the largest links, plus laboratory-tested operation, are features of the new load break lever made by Hubbard and Co., 200 S. Michigan Ave., Chicago 4, Ill.

The lineman is aided by a mechanical ratio of 5:1 in breaking the link. At the same time the cutout contacts are held closed by the upward thrust to prevent contact arcing —a serious hazard in the operation of a load break device.

Another advantage is the fact that the load break lever does not interfere with the operation of the cutout when interrupting its maximum fault capacity.

When equipped with this non-ferrous, corrosion-resistant load break lever the Faultmaster cutout becomes a safe, positive load interrupter under

any rated load. Operation is simple and easy. The upward thrust of the hook-stick breaks the fuse link inside the tube, shielding the operator from arc exposure. An additional safety feature, not always recognized, is that the lineman's spurs are deeply embedded with an upward thrust of the hook-stick as opposed to a downward pull.

Write U-1202 on reply card, Pg. 11

Auto-charge trip device opens conventional breakers

A NEW STATIC, auto-charge trip device that trips breakers on either dead or faulted power lines has been introduced as an optional accessory on metal-clad switchgear by General Electric Co., Schenectady 5, N. Y.

Major benefits of the new trip device include the elimination of a tripping battery, the saving of space required by a tripping battery and reduced maintenance.

The unit provides tripping power to open breakers even after a prolonged power outage. It eliminates the need for low-energy, high-impact breaker tripping mechanisms since it will trip breakers having conventional mechanisms.

The auto-charge trip device requires minimum maintenance since it is a solid state design with each element conservatively rated for maximum reliability.

All General Electric metal-clad switchgear using two-cycle breakers will be equipped to include the new auto-charge trip device.

Write U-1203 on reply card, Pg. 11

CP relay can detect reverse phase connections on lines

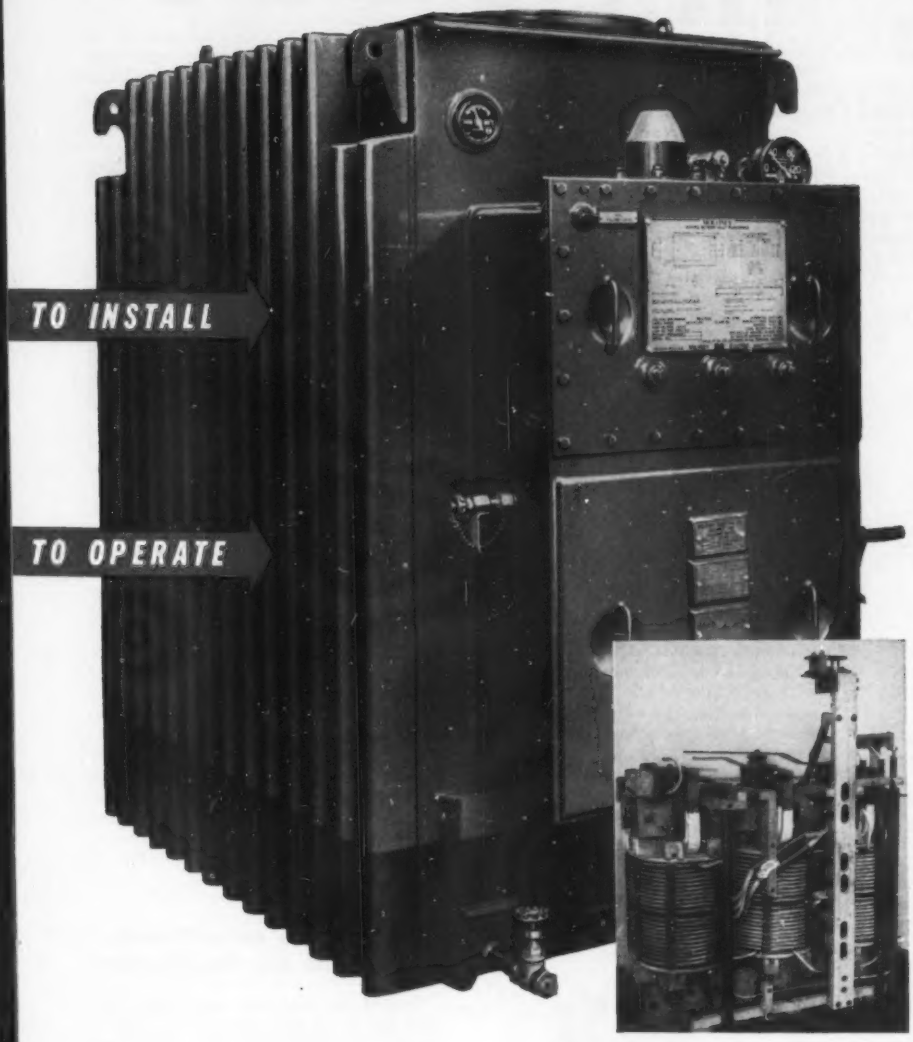
A NEW RELAY, type CP_2 used to detect reverse phase connections of transmission lines, transfomers, motors, generators or synchronous con-

densers is now available from the Westinghouse Electric Corporation, Box 2278, Pittsburgh, Pa.

The CP relay is a three-phase, contact-making voltmeter. One set of relay contacts closes on three-phase overvoltage conditions, and the other set of contacts closes on three-phase undervoltage, loss of voltage, reverse phase connection or serious phase unbalance. The main contacts of the relay close 30 amperes at 250 volts d-c, and carry this current for sufficient time to trip a circuit breaker.

The high- and low-voltage contacts are made of silver. Both have a vernier screw to provide adjustable contact wipe and assure positive contact. Relay designs are available which provide independent contact circuits.

ECONOMICAL



BECAUSE:

1. Each tank side completely corrugated out of one piece of metal, requiring welds only at the corners.
2. No thinning of the metal occurs at corrugations.
3. The corrugations do not need sidewall bracing therefore, another possible source of corrosion is eliminated.
4. Tank is easily cleaned from above and there are no inaccessible areas to hinder painting.
5. The tank and handhole covers are welded in place to eliminate the possibility of leaks, however, bolted covers are available if required.
6. Network transformers with corrugated tanks are smaller in size than old style tube type tanks.
7. Reduced size allows installation of larger units in existing vaults.
8. Protection against corrosion is provided by undercoating the base and the lower portion of the tankwall.
9. The core, coil, leads, supporting members and framework are uniquely combined to give ample electrical clearance and to obtain a rugged unit that is exceptionally compact.
10. Low sound level means better customer relations.

Moloney Network Transformers are uniquely designed both inside and out to provide a superior unit for use on secondary network distribution systems. The corrugated tank coupled with a compact, rugged core and coil assembly having high overload capability, offers the potential user many reasons for purchasing Moloney Network Transformers.

These units are available in types conforming to EEI-NEMA Standards or in types especially designed to meet the requirements of your network system.

Specify Moloney Transformers for every application . . . All Along The Line.

ME59-10

MOLONEY ELECTRIC COMPANY

Transformers for Utilities, Industry and Electronic Applications

FACTORIES AT ST. LOUIS 20, MO., AND TORONTO, ONT., CANADA

Sales Offices in All Principal Cities

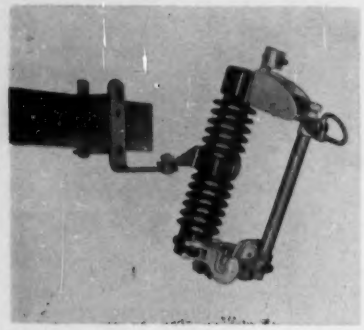
Requiring no external resistors, the CP relay is self-contained and has six times the torque of previous designs with only one-fourth of the burden. The calibrated scale has indexed markings of 70-120 volts or 140-240 volts. This relay can withstand 110 percent of rated voltage, continuously.

Write U-1204 on reply card, Pg. 11

Open cutout features stretch overcurrent protection range

A COMPLETELY new line of 100-ampere open cutouts, produced by Line Material Industries McGraw Edison Co., Milwaukee 1, Wis., extends overcurrent protection to a range previously unattainable. These cutouts, designated Type LMO, have voltage ratings of 7.8, 15, and 27-kv and feature exceptionally high interrupting ratings of 20000, 16000, and 6000 amperes, respectively.

Test-proven LMO cutouts afford superior fault-current protection to



distribution systems with voltages of 7200 volts delta through 14400/24900 volts grounded wye.

The LMO, being both economical and versatile, has interchangeable fuseholders that accept any EEI-NEMA standard button-type fuse link. Among the many LMO features are full range operation, non-ferrous components, positive latch with controlled opening, expendable cap, and locking flipper with controlled link tension.

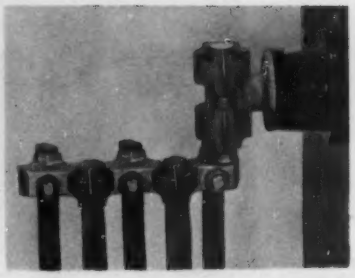
An important safety feature of the LMO is its ability to safely close in on faults. LMO aluminum parallel-groove terminal connectors accommodate conductor sizes through 4/0 ACSR and can be adjusted for either horizontal or vertical wire entrance.

Link-break fuseholders and 200-ampere disconnecting switch blades are also available with LMO cutouts.

Write U-1205 on reply card, Pg. 11

Multi-tap terminal adapters reduce connections and taping

A NEW SERIES of bronze multiple tap terminal adapters for distribution



transformers has been developed by Anderson Electric Corp., 700 N. 44th St., Birmingham, Ala.

Designated as the V&H Series, the new adapters allow the use of two or more cable taps from each secondary terminal, there-by eliminating excessive connections and taping. The use of several small cables instead of one large one also reduces the installation difficulty often encountered when trying to bend a large cable in close bank coupling.

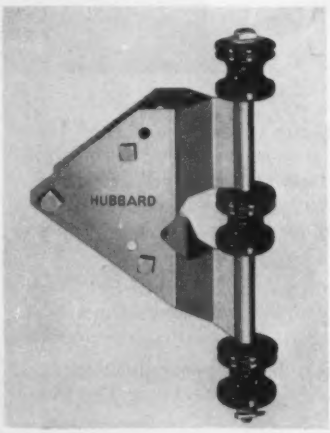
The V&H adapters will accommodate up to six cables and cover a copper conductor range of #8 solid to 1000 MCM. Stud sizes range from 3/8 inch to 1 5/32 inches. The connectors are equipped with high strength Anderloy eyebolts and can be supplied tin plated upon request.

Write U-1206 on reply card, Pg. 11

Secondary rack mounts on the end of a cross arm

HUBBARD AND COMPANY, 200 S. Michigan Ave., Chicago 4, Ill., has available a secondary rack which is mounted to the end of a cross arm to conserve pole space. Regulations calling for increased clearance and combined power-telephone pole construction have frequently produced such conditions and led to the adoption of the end-of-arm rack.

The Hubbard end-of-arm rack also permits the use of a shorter pole than would normally be required for joint construction clearances where



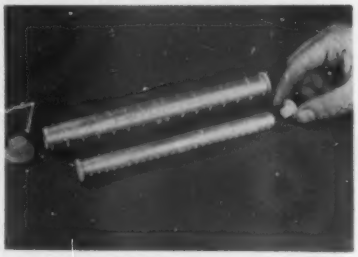
secondary services are taken from a rack on the pole.

This specialized space saving rack is formed of No. 12 ga. steel and is available for three or four conductors.

Write U-1207 on reply card, Pg. 11

Plastic caps now replacing protective adhesive tape

TO SIMPLIFY the installation of electrical connectors filled with corrosion-inhibiting compound, the Utility-Industrial division of Burndy Corp., Richards Ave., Norwalk, Conn.,



has begun to supply connectors of this type capped with yellow plastic "Caplugs."

A result of the company's continuing product improvement program, the new method of capping tubular compound-filled connectors has been applied to its "Unisplice" single-sleeve connectors for ACSR, and to its aluminum "Hysplices," and "Hyreducers." Replacing the adhesive tape formerly used, the caps provide cleaner, easier removal of the compound seal and improve the connector's appearance.

These and others of the company's connectors for aluminum have for several years been supplied pre-filled with "Penetrox" compound, which seals the joint and inhibits corrosion.

Write U-1208 on reply card, Pg. 11

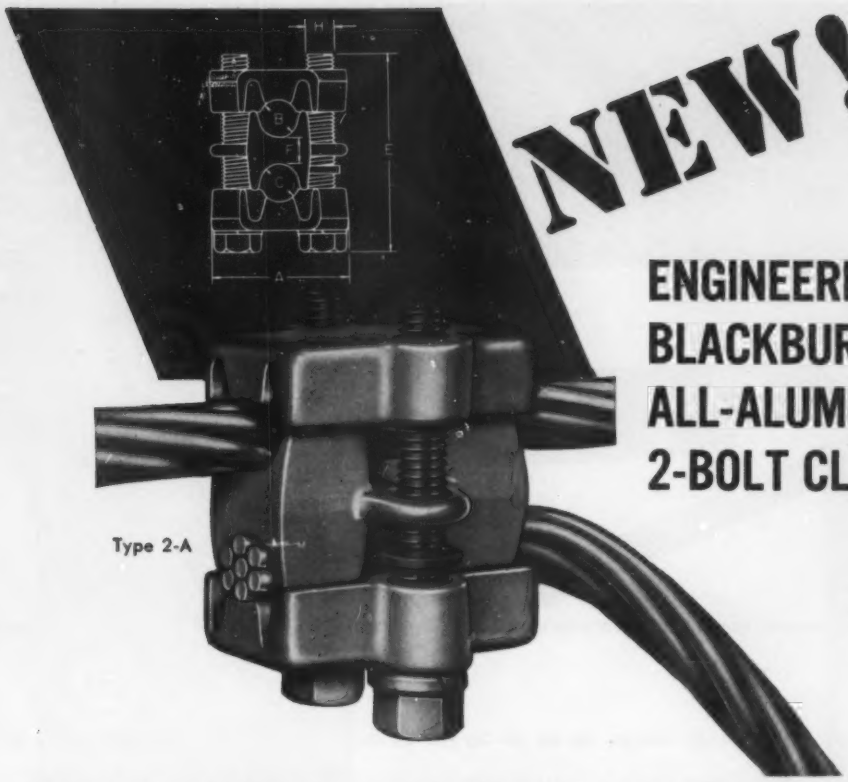
Lower exciting current levels available on new transformers

LOWER GUARANTEED exciting current levels for its entire line of distribution transformers 167 kva and smaller in all voltage classes have been announced by Allis-Chalmers Mfg. Co., 938 S. 70th St., Milwaukee 1, Wis.

The new levels, up to 60 percent below those previously published, have been made possible through improved silicon steel handling and processing techniques, and transformer design changes.

The new lower exciting current values are significant to utilities since they result in more efficient system operations as well as reduced overall installation costs.

Write U-1209 on reply card, Pg. 11



NEW!

ENGINEERED INTO BLACKBURN ALL-ALUMINUM 2-BOLT CLAMPS...

ALL WEATHER PROTECTION

On Aluminum or Bi-Metallic Connections

Contact surfaces guarded by rainshield design of castings—inhibitor will not "wash out" even under driving wind and rain.

Condensation is drained off through ports in castings regardless of installation position—never allowed to accumulate around the conductors.

Designed with hot stick crews in mind.

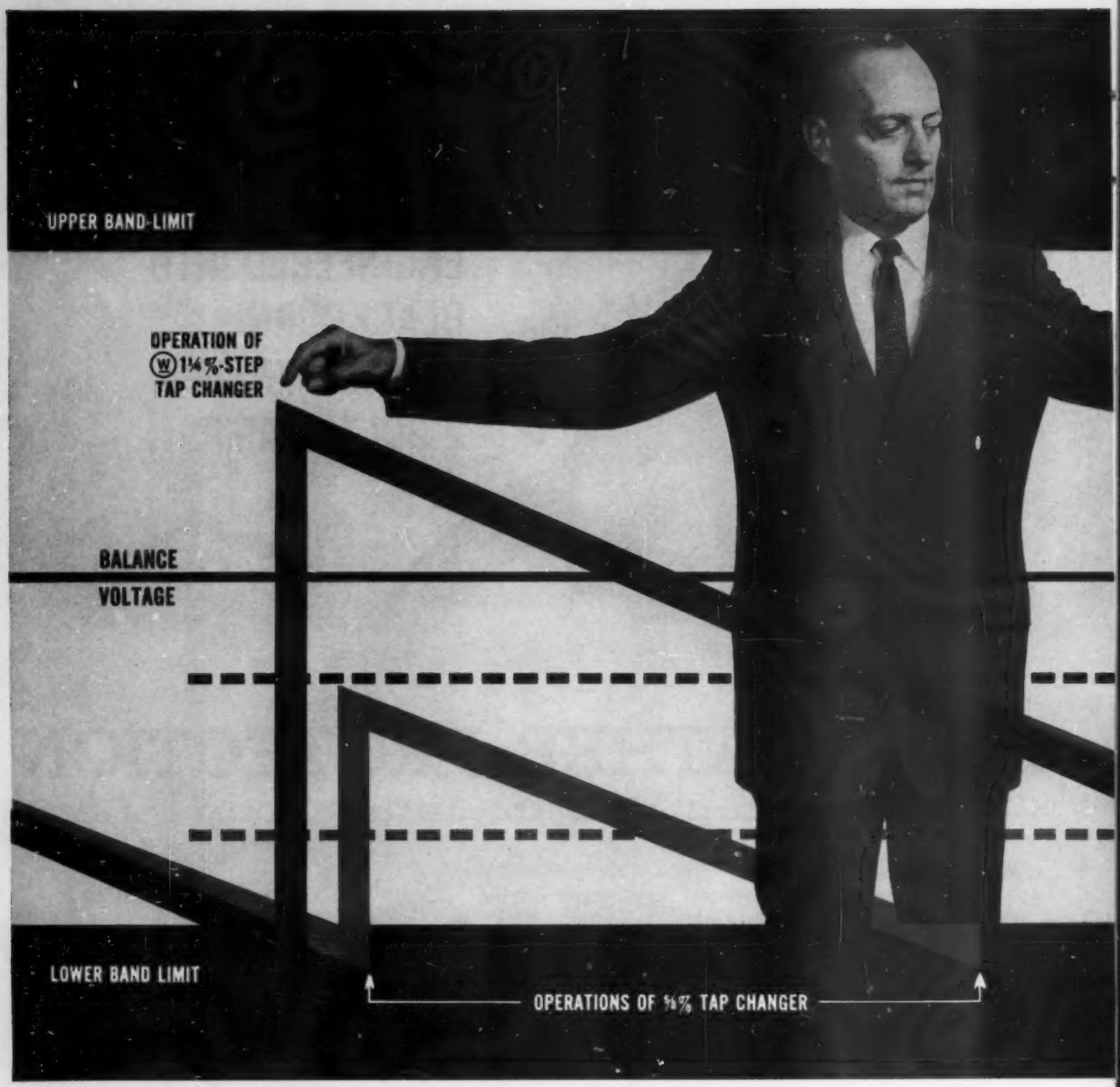
Massive all-aluminum clamp—including hardware—may be used on aluminum or on copper conductors with inhibiting compound. Extra thick, highly conductive aluminum spacer separates dissimilar conductors for added corrosion protection.

Four clamps accommodate a wide range of wire sizes—main from 6 to 795 ACSR, tap from 8 to 397.5 ACSR. Write for samples and literature.

LIVE BETTER ELECTRICALLY

Jasper
BLACKBURN
Corporation

1525 Woodson Road • St. Louis 14, Mo.

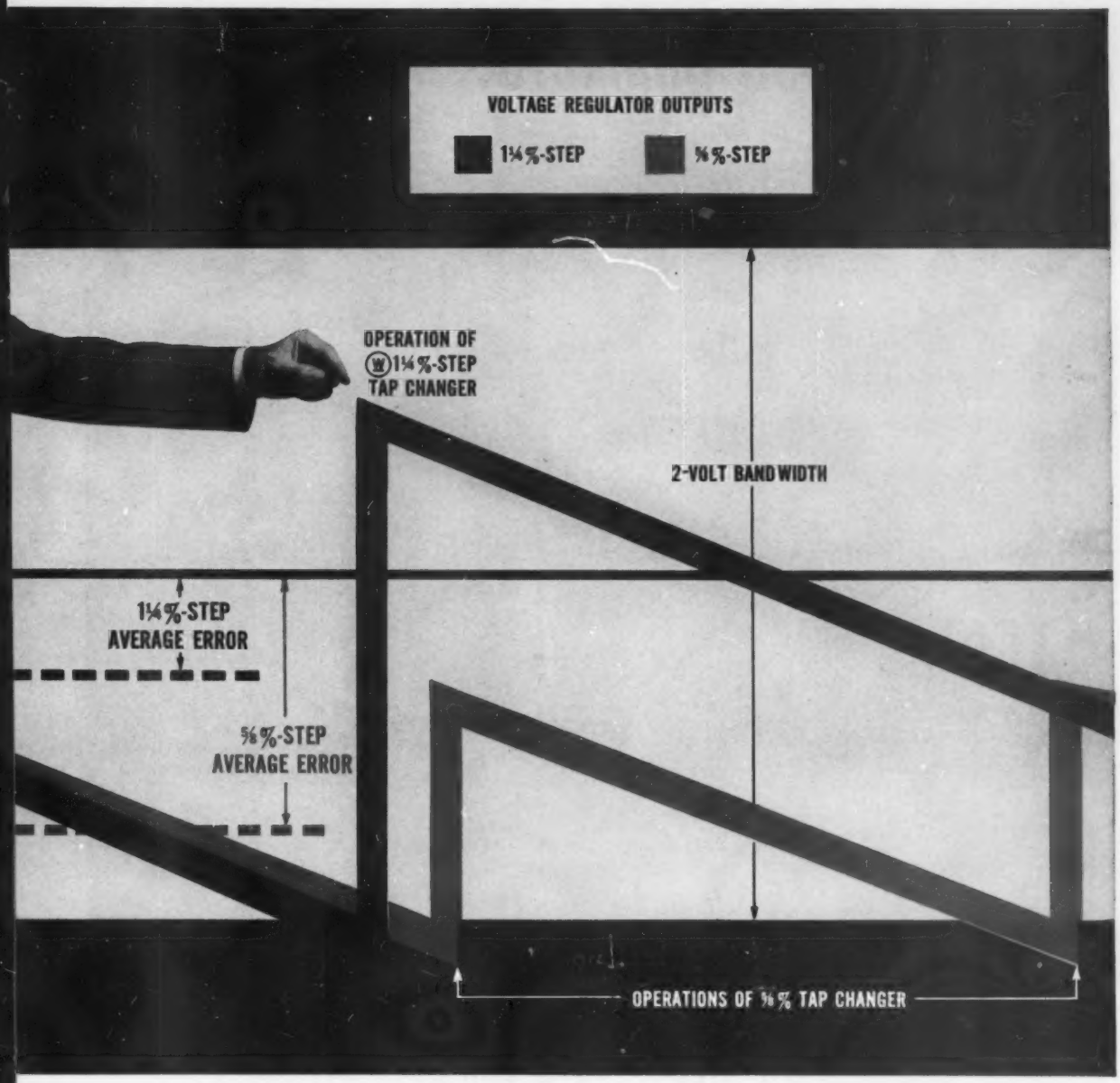


Here's how Westinghouse 1¼%-step regulation provides

Tap changer operations are the key to good system voltage control since no regulating is done until the tap changer operates. For best results, tap changes should be correctly timed and reasonable in number.

With ordinary control schemes, voltage relay bandwidths are often set in such a manner that it becomes necessary to effectively widen the band by adding fixed time delay to prevent an unreasonable number of tap changer operations. Where this is done, regulator output voltage bandwidth may vary widely, depending on the rate and extent of variation of input voltage. But with Westinghouse URL and URF regulators, you set the bandwidth you want and the unique CVR inverse time voltage relay, combined with instant response tap changer, prevents sustained wide voltage variations which are possible with fixed time delay. The result . . . a narrower effective band in the actual output where it counts. As an added benefit, the larger step gives an average voltage closer to midband, as shown in the illustration above.

You can protect your customers against abrupt voltage changes, get narrower effective bandwidths, and achieve better average levels when you use



closer voltage control . . . with fewer operations

Westinghouse 1¼ %-step regulators; and you get longer life with reduced maintenance because fewer operations are required.

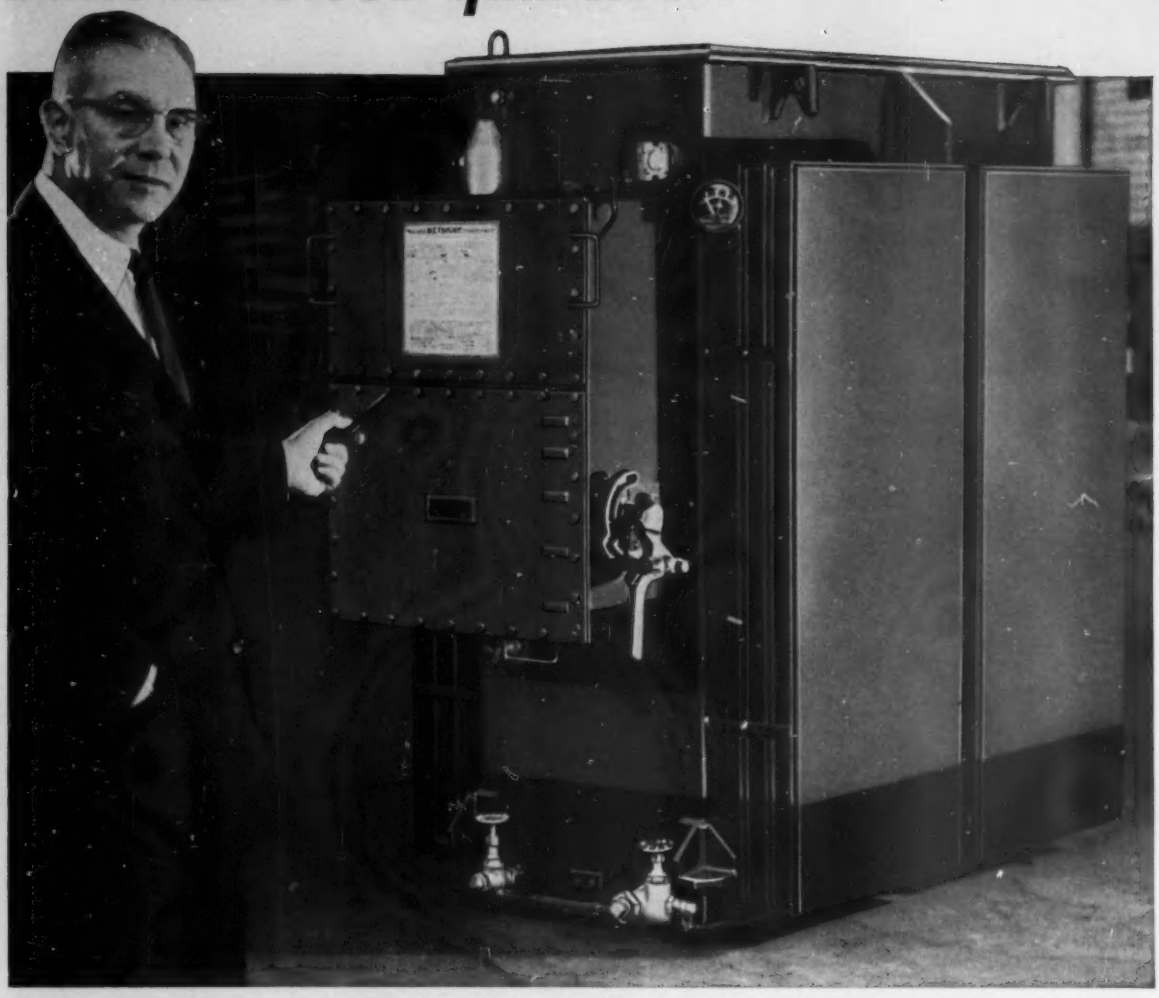
Ask your Westinghouse sales engineer for further details about the bonus values from Westinghouse 1¼ %-step voltage regulators. J-70902

YOU CAN BE SURE...IF IT'S

Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV FRIDAYS

Built for close quarters...



WAGNER NETWORK TRANSFORMERS

are small in size... have compact switch... feature panel radiators for smoother contour

Wagner network transformers are designed to give you smaller, lighter units, with smoother contours for easier maintenance. You can cut network system costs by using smaller vaults with these space-saving transformers—or you can put larger ratings in your present vaults. You save on maintenance, too. The panel type radiators are easy to clean, and an anti-corrosive tank finish protects exterior surfaces for years, under the adverse conditions of underground installation.

NEW WAGNER-DEVELOPED ROTARY SWITCH ... The rotary-type, liquid filled high voltage switch was designed especially to meet the requirements of network systems—it is smaller in depth than previously used knife-blade type switches.

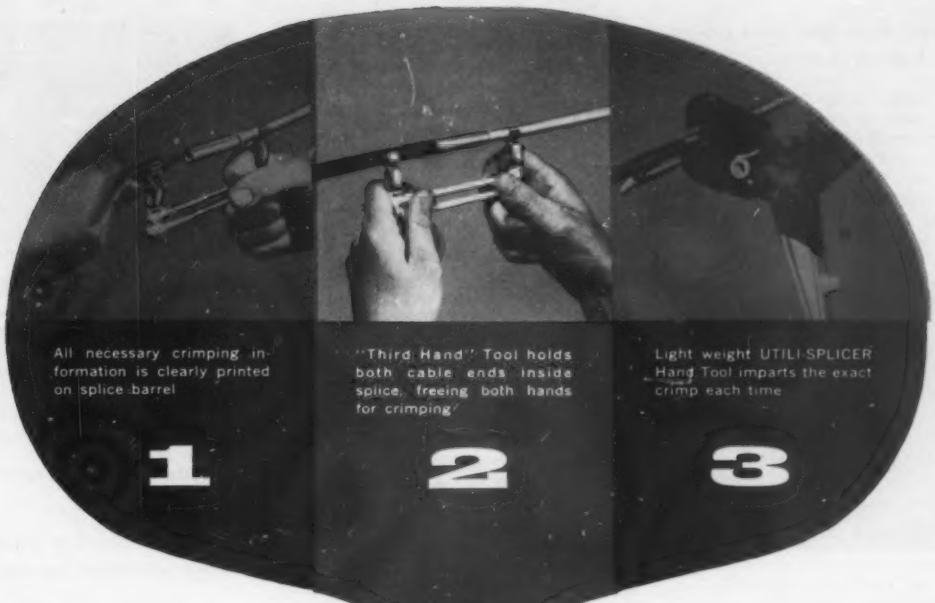
LOWER NOISE LEVEL... Improvements in core design and materials, and newly developed methods of treating the core steel have made lower noise levels a feature of all Wagner transformers.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation

6440 PLYMOUTH AVENUE, ST. LOUIS 33, MISSOURI

WT59-7A


All necessary crimping information is clearly printed on splice barrel
1
"Third Hand" Tool holds both cable ends inside splice, freeing both hands for crimping
2
Light weight UTILI-SPLICER Hand Tool imparts the exact crimp each time
3

SIMPLICITY!

Now, the AMP Step-Down UTILI-SPLICE, combined with the new light weight crimping tool and the "Third Hand" Tool, give you still greater economies in your step down splices, savings in man-hours plus AMP's reliable attachment method. For all stranded, solid or ACSR conductor combinations in copper and/or aluminum . . . wire size range #8 through #1/0 AWG.

Send for more information today.

CHECK OFF THESE ADDITIONAL HIGHLIGHTS:

- **long-life corrosion resistance from special tin plating and from inhibitor-sealing compound that pre-cleans contact surfaces**
- **splice lengths proportioned to the cross section of cable**
- **optimum heat dissipation**
- **wire-stops assure proper insertion depth of stripped cable**
- **maintenance free**

American Pamcor, Inc.

GENERAL OFFICES: 181 HILLCREST AVE., HAVERTOWN, PA.

Exclusive Distributor For AMP Products To The Utility Industry

Cable-type fuse link uses removal button heads

A NEW CABLE-TYPE universal fuse link that uses a removable button head has been introduced by General Electric Co., Schenectady 5, N. Y., for use with all modern open and enclosed distribution fuse cutouts.

Designed for optimum fuse-system coordination and cutout performance,

according to G-E development engineers, the new EEI-NEMA link will help simplify stocking and inventory control problems.

More positive low current clearing than ever before is possible with the universal link because of a longer auxiliary tube than on previous units and an internal spring—on fuses up to 20 amperes. Also, the tube is sealed at the top of the cable-type link to prevent gas from escaping.

The new design is available in the EEI-NEMA K&T series and Hi-Surge series. The new fuse links have extremely accurate time-current characteristics, according to the engineers at General Electric's Lightning Arrester and Cutout Section at Pittsfield, Mass.

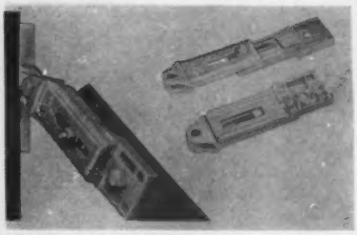
Write U-1210 on reply card, Pg. 11

Adjustable link connects irregular "H" frame braces

A NEW ITEM of spar connecting hardware, for heavy duty "H" frame construction, which permits relatively low cost erection even with moderately irregular members is the MIF adjustable link announced by Malleable Iron Fittings Company, Pole Hardware Division, Branford, Conn.

With the use of this link, up to a 6 inch adjustment is possible at each end of the inner and outer braces of the "H" frame superstructure eliminating the need for field drilling previously required due to sweeps and crooks in the poles and round members.

This versatile fitting has the MIF Grid Gain type of pole contacting surface, with integral teeth and spurs



to grip the round member and distribute the load over a large area instead of concentrating it on the wood around the thru bolt hole. Single bolt connections keep erection costs at a minimum.

It is made of tough malleable iron, hot dip galvanized for greater corrosion resistance.

Write U-1211 on reply card, Pg. 11

Changed derrick pivot point helps stabilize heavy truck

A NEW LINE of public utility truck bodies has been designed by York-Hoover Corporation, York, Pa. The new "Bobcat" Line Construction Body series was developed as a result of the demand for more stability in the line construction truck when heavy loads are being handled by the derrick.

WHY G-E FUSE LINKS GIVE MAXIMUM SYSTEM PROTECTION

By D. L. McINTIRE—Lightning Arrester and Cutout Product Planning Specialist

General Electric universal fuse links give you maximum overcurrent protection on distribution systems. Designed for use in every type of cutout, these fuse links are available in fast (K), slow (T), EEI-NEMA Types from one to 100 amperes, and high-surge links up to eight amperes. Ratings of 140 and 200 amperes are available in the solid-head type only.

General Electric universal fuse links offer you these important advantages:

Premature melting is eliminated by silver plating threaded parts to maintain low contact resistance.

Efficient low-current operation is assured by the bonding process and a specially prepared paper in the auxiliary tube.

Fuse withstands continuous overcurrents. General Electric EEI-NEMA fuse links will withstand continuous overcurrents of approximately 150 percent of rating.

Instant separation is assured by new internal spring that prevents cable fouling inside the auxiliary fuse tube.

Drop-out interference is eliminated by the use of a flexible cable. Fine-stranded cable can be used since the G-E fuse element has excellent temperature control.

Like more details? Contact your G-E Sales Engineer today, or write to Sect. 435-23, General Electric Co., Schenectady, N.Y.

GENERAL ELECTRIC

In the past, derrick support jacks were necessary to keep the truck from tipping under the load of heavy poles. When these jacks are used, the vehicle is immobilized and cannot be moved without serious damage to the support jacks.

In the "Bobcat" series, the rear overhang of the body has been reduced to get the pivot point of the derrick closer to the rear wheels of the truck and thus to get the center line of the load also closer to the rear wheels. The distance from the center line of the rear axle to the rear of the body is only 26 inches on this unit.

This short distance makes a tail shelf on the back of the body mandatory in order to cover the rear spring hanger of the chassis. Much larger poles can thus be handled with a unit of this type without the use of immobilizing derrick support jacks.

This bob-tailed vehicle is combined with other design features which result in a rugged, durable, lightweight construction body.

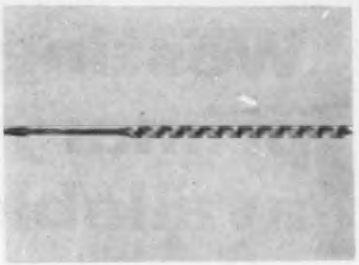
Write U-1212 on reply card, Pg. 11

Chips "flow" as bit bores into telephone, power poles

A NEW WOOD BIT for easier and faster non-stop boring in telephone and power poles has been developed by the Irwin Auger Bit Co., 92 Grant St., Wilmington, Ohio.

Called the 415T Pole-Bor, this new Irwin bit is specially designed to eliminate the problem of clogging, binding and stopping to clear chips, particularly in hard-to-bore creosoted poles or heavy construction timber. The combination of specially designed cutting head, twist angle, smooth polished hollows, spur, and side lip guarantees a continuous chip flow and smoother holes for easier insertion of bolts and pins.

A new and patented adapter shank permits the Irwin Pole-Bor bit to be used in both hand braces and electric drills to speed work on the job and also cut inventory costs by as much as 50%.



Overall length of the bit is approximately 18", with 12" twist and 6" shank. 12 sizes now available from Irwin distributors, 6/16" to 17/16".

Write U-1213 on reply card, Pg. 11

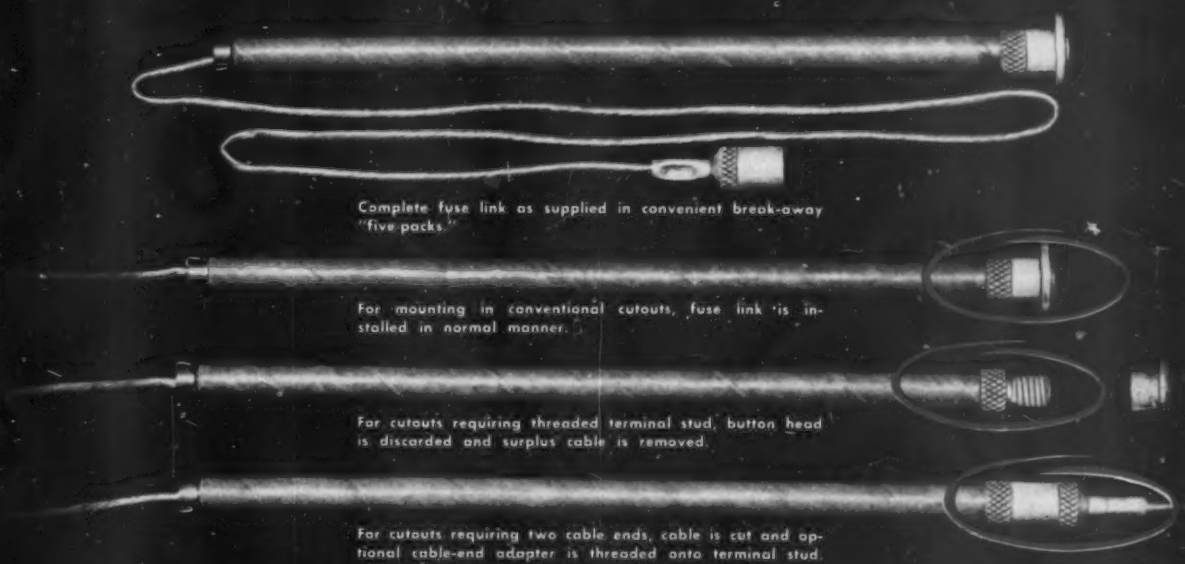
Power operated pole aligner eliminates need for pike poles

A NEW POWER operated pole aligner, designed to handle any size pole, was announced by the Calavar Corporation, 2700 S. Broadway, Los Angeles 7, California.

The Hydra-Pike consists of two pincer-type arms mounted on a steel platform at the derrick head sheave. The arms or pincers are hydraulically operated. Hydraulic line retracting system is available for telescopic resourceful engineer to do most

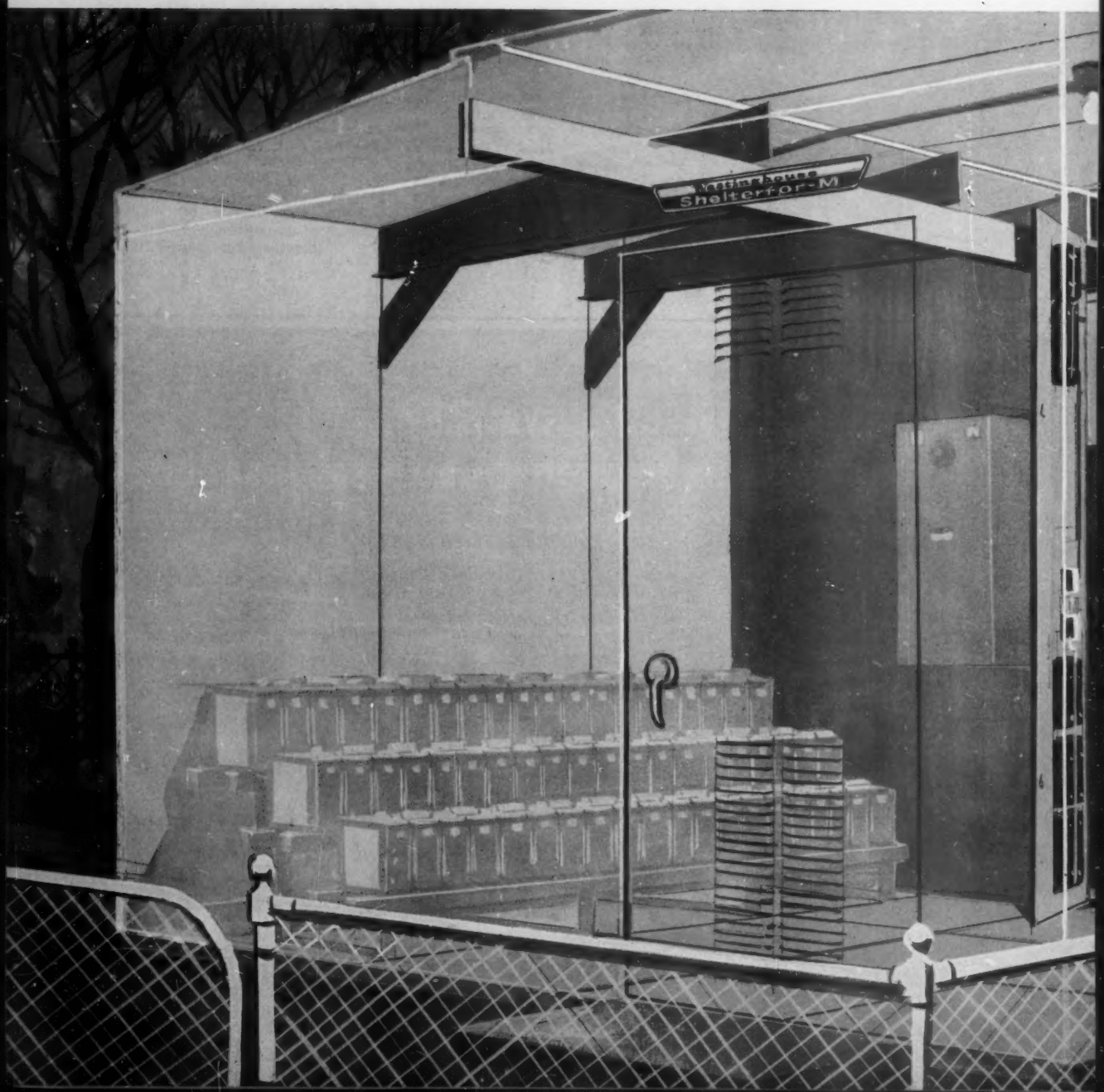
(Continued on page 72)

interrupted quickly—effectively, by
General Electric universal fuse links


Complete fuse link as supplied in convenient break-away "five packs."
For mounting in conventional cutouts, fuse link is installed in normal manner.
For cutouts requiring threaded terminal stud, button head is discarded and surplus cable is removed.
For cutouts requiring two cable ends, cable is cut and optional cable-end adapter is threaded onto terminal stud.

GENERAL ELECTRIC

Westinghouse primary unit substations available with Shelterfor-M* all-weather service area



Your crews will *pick* poor-weather days for inspection and testing of Westinghouse outdoor metal-clad switchgear. Protected aisles and the new integral service area of Shelterfor-M† switchgear permit crews to work *inside* on *outdoor* switchgear in cold, rain, snow or sleet. No need to hang canvas tarps and build makeshift shelters to work on breakers, instruments or relays when the weather is bad.

Roomy aisles of Shelterfor-M give you ample room to pass two breakers . . . plenty of room to pull out units for inspection.

Where required, the new Westinghouse modular service area units can be added to provide additional area for batteries, maintenance, storage and other facilities. This eliminates conventional concrete block buildings that often are erected in a corner of the station plot.

For complete information, call your Westinghouse sales engineer, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. J-60973

*Shelterfor-M . . . shelter for maintenance
†Trade-Mark

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From regulator to lamp
. . . use cost-saving
SUPERIOR CABLES

Thermoplastic Series Lighting Cables

- High resistance to earth acids and alkalis
- High resistance to sunlight, moisture, weather
- Small diameter, lightweight
- Easy to splice

Figure 8 Pole & Bracket Cable

- High resistance to abrasion, mechanical damage
- Does not deteriorate with age or weather
- Will not support combustion
- Flexible, strips clean, speeds installation

Performance and economy go hand in hand with SUPERIOR plastic insulated and jacketed cables.

All SUPERIOR CABLES are quality-engineered, precision manufactured and thoroughly tested.

From regulator to lamp . . . for low initial cost . . . for less maintenance cost . . . order SUPERIOR CABLES!

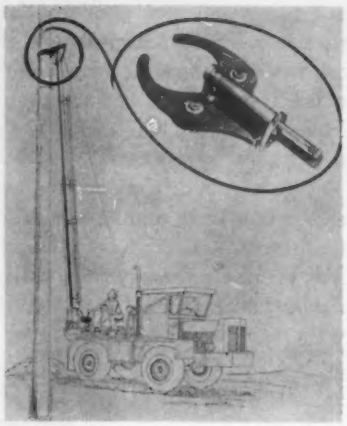
For complete information and prices, write

SUPERIOR CABLES

SUPERIOR CABLE CORPORATION

Hickory, North Carolina

3869



booms. The complete system can be mounted on most derricks, cranes, booms, and diggers used throughout the utility industry. The finger-tip controls can be mounted anywhere.

Designed for one man operation, the Hydra-Pike eliminates the need for pike poles to align utility poles. Furthermore, it eliminates the hazard of injuries to personnel.

Write U-1214 on reply card, Pg. 11

New trencher handles wider, deeper trenches

THE NEW 12 horsepower model M-322 Ditch Witch from the Witch Marketing Co., 1959 West Fir Ave., Perry, Okla., cuts trenches to 5 feet depths and 12 inch widths. The new trencher has been scaled up from the popular model M-3 to handle wider and deeper trenches and even tougher digging conditions. The model M-322 can now be used for foundation footings, sewer laterals, drain fields (double cut trench), water lines to 5 foot cover, gas services and main extensions, underground telephone cable installation, oil field gathering systems, etc.

The model M-322 is powered by a Wisconsin AGN 12 horsepower, air cooled engine and equipped to dig ditches 5 feet deep, 4 inches wide; 4 feet deep, 6 inches wide; 3½ feet deep, 8 inches wide; 3 feet deep, 10 and 12 inches wide, in any soil.

Write U-1215 on reply card, Pg. 11

EASIER TO DO... and costs less too!

B-M
INDENTER FITTINGS and TOOLS

Here is the combination that is unbeatable when it comes to easier E.M.T. installation at less cost. New lightweight plier size indenters make setting up thin wall conduit a breeze. B-M fittings are neater too! No unsightly nuts or projecting set screws.

A few more of the plus features of B-M fittings are Concrete tight—Vibration resistant—Extra heavy bright zinc plate, salt spray and acid drip tested for corrosion resistance—Extra heavy positive bonding locknuts—Smooth rounded edges or bushed throat type connectors that prevent insulation damage—All steel construction with extra heavy gauge wall thickness.

Red Throat
BM-21B
½" Connector

Red Throat
BM-22B
¾" Connector

Red Throat
BM-23B
1" Connector

BM-41
½" Coupling

BM-42
¾" Coupling

BM-43
1" Coupling

BM-51
½" Offset Connector

BM-21
½" Connector

BM-22
¾" Connector

BM-23
1" Connector

BM-No. 600
Changeable Jaw Indenter

BM-No. 1000
Handvise for ½", ¾" and 1" E.M.T.

BM-No. 100
Cutter for ½", ¾" and 1" E.M.T.

BM-No. 607
½" Indenter
BM-No. 608
¾" Indenter

All B-M indenter type fittings far exceed the requirements of U. L. file card E 10863 and Federal Specifications W-F-406.

BRIEGEL METHOD TOOL CO.
GALVA • ILLINOIS

Out of Your Investment in Westinghouse Research Came a Great Advance in Network Transformers . . .

IN 1956 Westinghouse introduced the revolutionary Space-Miser network transformer—a compact design, 20% lighter in weight, that enabled utilities to save 15% in vault space for a given kva rating.

IN 1957 the Space-Miser design established itself as pacesetter of the industry.

IN 1958 as the rest of the industry rushed to match the new standards in economy, reliability and maintenance made possible by this new unit, Westinghouse extended Space-Miser design to the full range of EEI-NEMA ratings.

IN 1959 Westinghouse has continued to set the pace with refinements in Space-Miser tank design and by adding the exclusive Insuldur* insulation system.

FOR OVER THREE YEARS Space-Miser design has set the pace for industry progress with resulting benefit for every utility network system. This is a clear-cut example of how electric utilities' dollars, spent with Westinghouse, have reaped research and development dividends in increasingly efficient equipment.

For more information, contact your Westinghouse representative . . . or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. J-70903

*Trade-Mark

SPACE MISER the network transformer that changed the thinking of an industry

SPACE-MISER NETWORK TRANSFORMERS changed industry thinking in . . .

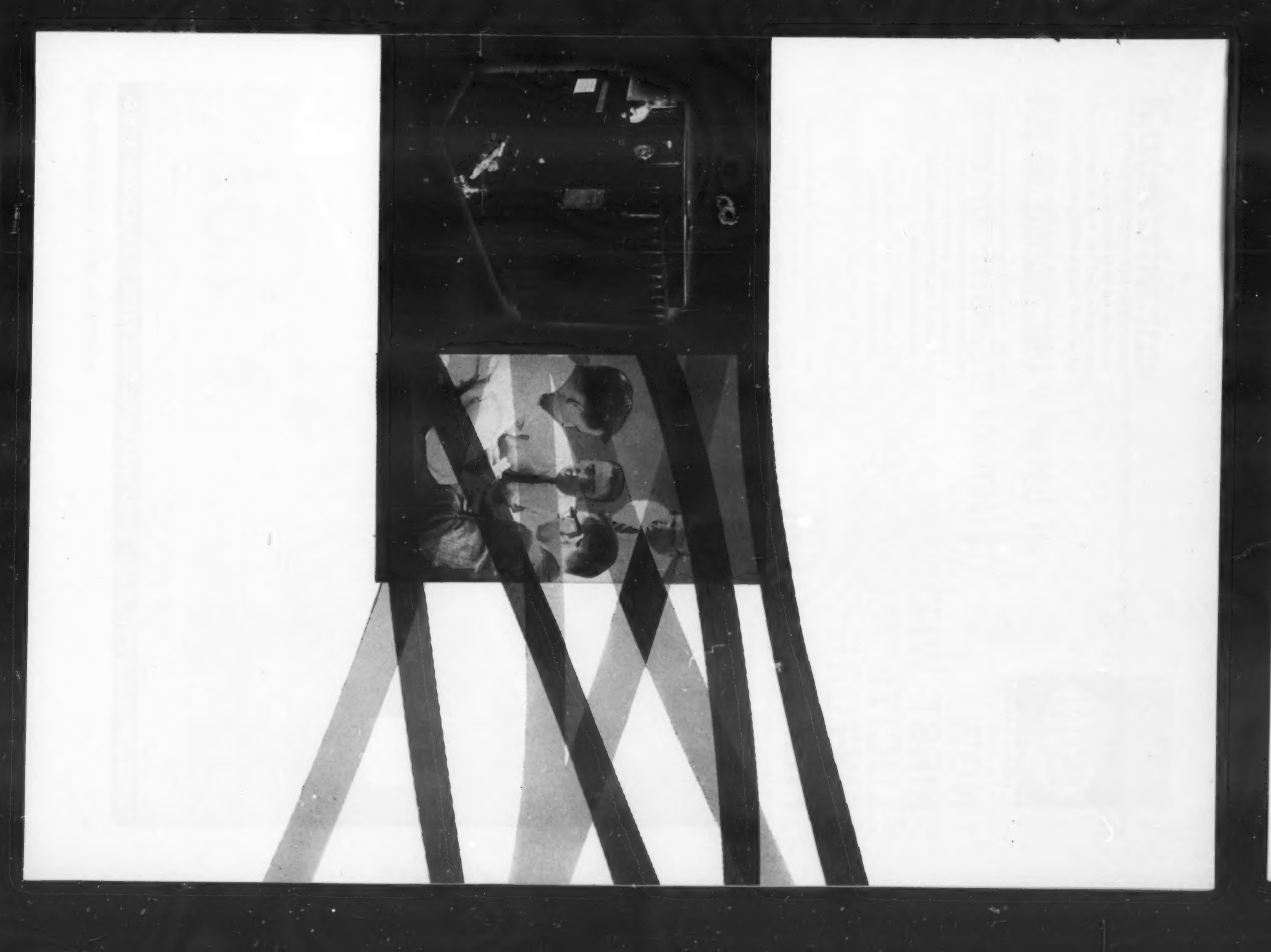
Maintenance Savings—Smooth-Form tank and Yukon coolers permit more uniform finish, simplify inspection and repainting, and reduce collection of corrosive deposits.

Installation Savings—Small size and light weight make handling easier, faster, safer. Required vault space is smaller. In addition, low height permits off-the-floor mounting without extra-cost excessive vault depth.

Improved Reliability—Insuldur insulation system permits 10° more overload temperature without additional loss of insulation life. Other features which boost reliability include superior design bushings, rotary disconnect and grounding switch and easily accessible high-voltage terminal chamber.

YOU CAN BE SURE...IF IT'S Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV FRIDAYS



ALWAYS FIRST WITH FINER LIGHTING

Guth

LIGHTING

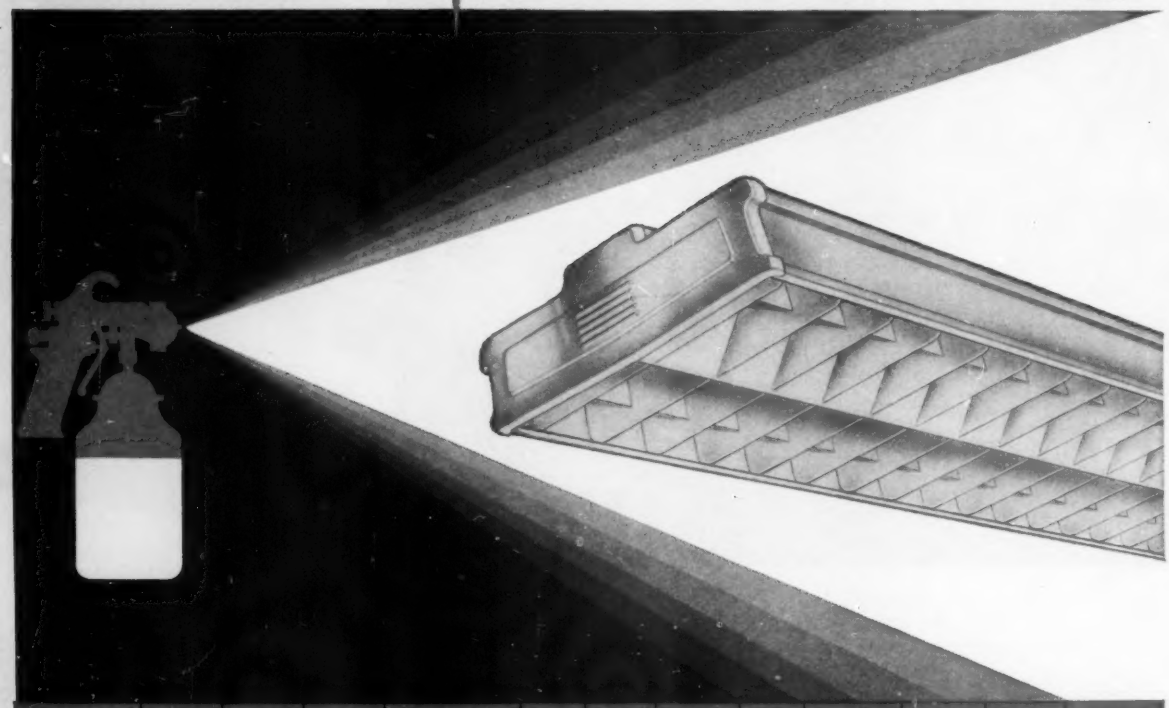
NOW FIRST WITH LUCITE* "ACRYLIC" FIXTURE FINISH

... for greater efficiency—longer lasting beauty—easier maintenance

The same brilliant acrylic-base finish used on millions of late model autos (no polishing in 3 years) ... can now be specified on Guth Fluorescents, *at no extra cost!* This means Guth Fixtures offer even more *exclusive* advantages:

1. An extra-rich, sparkling white finish.
2. Maximum reflectivity and light output.
3. Greater resistance to all common stains ... original efficiency lasts longer.
4. Easier maintenance than other enamels. Dirt and dust can't embed itself in this 175% harder finish. Wipes clean quick.
5. A tougher finish—superior resistance to chipping and scratching.
6. 50% less discoloration when exposed to ultraviolet.

MR. SPECIFIER ... check the fact chart below ... see exactly how much better this new finish is. AND—SPECIFY ACRYLIC for your NEXT JOB! *® DuPont



	Adhesion To Metal	Humidity Resist.	Salt Spray Resist.	Fume Resist.		Stain Resist.	Grease Resist.	Hardness	Mar Resist.	Reoperated Adhesion	Baking Color Stability	Heat Resist. (1)	Color Items Exposed to Ultraviolet
				Grease	Tobacco Smoke								
GOOD QUALITY FINISHES	3.0	8.5	8.5	7.5	6.5	8.9	7.0	8.0	8.5	8.5	7.5	5.0	6.0
NEW GUTH LUCITE* FINISH	9.5	10.0	9.5	8.5	8.0	9.0	10.0	22.0	9.5	10.0	8.5	9.0	9.0
PERCENT BETTER	18.75%	17.65%	11.76%	13.33%	38.46%	80.00%	42.86%	175.00%	11.76%	17.65%	13.33%	80.00%	50.00%

(1) 30 min. at 400° F. *® DuPont

THE EDWIN F. GUTH CO. · 2615 WASHINGTON BLVD. · ST. LOUIS 3, MO.

Know the law

by Arthur L. H. Street

Repair periods not covered by generator insurance contract

◆ ELECTRICAL GENERATORS in an industrial plant were insured against accidental damage while in use or connected ready for use. One generator was accidentally damaged while closed down for grinding of its commutators and while no current was being delivered by it. Did the policy cover the damage?

No, decided the United States District Court, Eastern District of Tennessee, in the case of Foote Mineral Co. v. Maryland Casualty Co., 173 Fed. Supp. 925.

The decision was influenced by the fact that the policy specially excluded coverage of accidental damage occurring while the generator was being "repaired." The damage resulted from accidental fire and explosion caused by sparks that resulted from the grinding of the commutators.

Generator off the line

The generator was not on the line at the time this work was done. The circuit breaker located between the generator and cell room was open; all of the 320 brushes were removed; one brush holder arm was removed, and the precision grinding instrument was installed in its place. The generator was disconnected so it was incapable of furnishing power to cell rooms to manufacture manganese metal.

Before the generator could have returned to use it would have been necessary to complete the grinding, restore the brush holder arm, install a complete set of carbon brushes, reseat the brushes, remove any copper dust that may have settled on or around the machine incident to the grinding of the commutator. This procedure would have taken several hours. The generator was incapable of supplying electric current to the cell rooms after the carbon brushes were removed from the generator.

Here are the high spots of the court's opinion: "Plaintiff contends that the generator was in use or at least connected ready for use at the time of the incident as it was part of a set consisting of the exciter, motor, and generator; that the exciter was energized and the motor was being run by alternating current furnishing a mechanical power to rotate the shaft so that the commutator of the generator could be resurfaced with the precision grinding instrument.

"Plaintiff further contends that precision grinding of the commutator was one of the uses for which the generator was purchased, and that such use was in contemplation of the parties to the contract.

"Plaintiff also insists that this is at least a reasonable interpretation of the language of the policy, and that since it is subject to more than one interpretation, that the interpretation which is most favorable to the insured must be made.

"If the language in the policy is ambiguous so as to create doubt or uncertainty of meaning, the Court should adopt the construction most favorable to the insured . . .

Circumstances described

"A motor was performing the function of driving the generator at the time of the accident. The generator was not producing direct current. This was the purpose for which it was designed, or as the experts sometimes stated, it was not converting alternating current into direct current, for use in the electrolytic cells for the manufacture of manganese metal.

"At the time of the accident the generator was not connected with the cells. The brushes which were designed to take the current from the commutator to the bus bars were disengaged, and in the language of the witnesses 'the machine was off the line.'

"The proof shows that the hazards are greatly increased when work is being done on the generator.

"The proof further shows that it is not feasible—if not impossible—to grind a commutator while the generator is in use or connected ready for use. There is danger of the workmen permitting some tool to come in contact with the machine, and there is the danger to the workmen themselves. These are hazards which do not exist while the generator is in use. Payment of a larger premium is required for coverage while the generator is not in use or connected ready for use. Premium was not paid for the coverage contended for by plaintiff in this case.

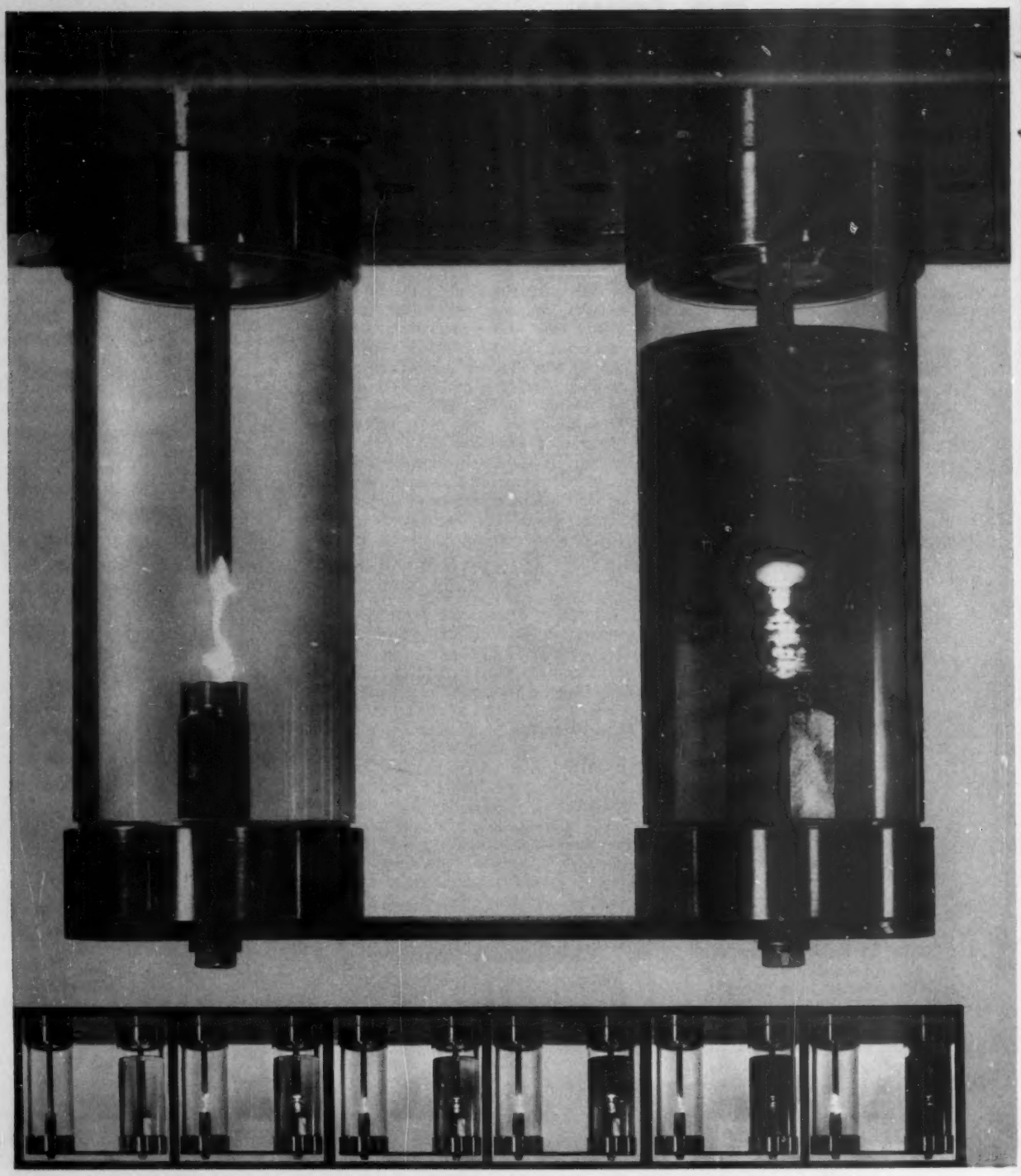
Repair vs. maintenance

"The witnesses introduced by the plaintiff testified that the words 'repair' and 'maintenance' have a technical and distinctive meaning in the electrical industry, while the witnesses for the defendant testified that these words have the same meaning in the electrical industry as they do in other businesses.

"Plaintiff's witnesses expressed the view that the word 'repair' applies only to situations where a machine has suffered a complete breakdown and that some part, or parts, must be replaced because of having been severed or broken. 'Maintenance,' according to them, is that which periodically occurs. Repair has an element of the unexpected in it. Maintenance is planned for while repair is not. Repair is something unexpected; maintenance is something you see ahead.

"Witnesses for the defendant were of the opinion that repair is fixing worn out parts or defects caused by breaks. Maintenance is doing something to preserve the machine. Repair does not include cleaning and periodic inspections; while maintenance does include cleaning and periodic inspections and, as one witness put it, this is the only difference between the two terms. This same witness classified 'repair' as everything done while the machine is out of service; while 'maintenance' does

(Continued on page 103)



THIS SIMPLE TEST PROVES SF_6 (LEFT) REMAINS UNCONTAMINATED AFTER REPEATED INTERRUPTIONS...WHILE OIL (RIGHT) SHOWS EVIDENCE OF CARBONIZATION

In this demonstration, SF_6 gas has quenched a series of arcs with negligible decomposition, as proved by mass spectrographic analysis of the material before and after the test. The oil, after the same number of interruptions, has carbonized and blackened showing obvious signs of deterioration. This means that the intervals between maintenance operations on a breaker using sulfur hexafluoride gas can be greatly increased.

SF_6 gas stability cuts breaker maintenance

Makes possible greatly improved performance from 34.5 kv to 460 kv and beyond

High stability of SF_6 gas as an arc-extinguishing medium will bring you economies in the operation and maintenance of power breakers never before possible. New Westinghouse SF_6 breakers combine many of the recognized advantages of both oil and air breakers, and in some respects are superior to either.

The great stability of SF_6 (sulfur hexafluoride) assures long life of the gas as both an arc-quenching and an insulating medium, even with repeated interruptions. SF_6 has extremely high dielectric strength, recovers full dielectric properties rapidly . . . assures unexcelled arc extinction time after time. SF_6 is inert, nontoxic, nonflammable, odorless . . . entirely safe. These qualities, plus the quiet operation of the closed SF_6 gas system, make SF_6 breakers ideal for all substations . . . even in urban locations where noise may be a problem. New Westinghouse SF_6 breakers are easier and less expensive to install and to maintain than any power breaker available today.

Westinghouse power circuit breakers using SF_6 gas are basically new. But they have proved themselves at several voltages and also promise the most practical design avenue in capacities of 460 kv and beyond.

Westinghouse suggests you buy two of these new breakers in widely separated ratings and apply them in entirely different operating situations. Prove to yourself that they will give you combined performance and economy you cannot get in any other breaker.

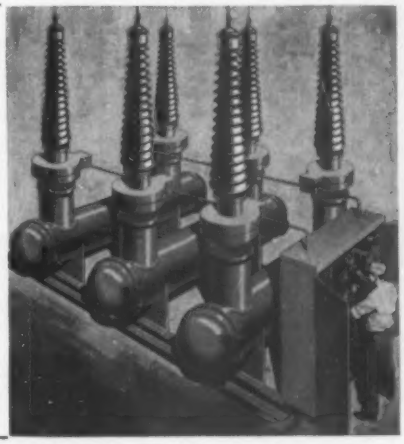
Call your Westinghouse representative today. Or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

J-60981

PROVE THE OUTSTANDING PERFORMANCE OF THIS BREAKER ON YOUR OWN SYSTEM

The principle of circuit breaker design using SF_6 gas has already been proved successful on several operating systems. Breakers from 46 kv to 115 kv have now completed over two years of service.

With SF_6 breakers you get: FAST INTERRUPTION; EASY INSTALLATION; SIMPLE, LIGHT FOUNDATIONS . . . no ground shock during interruption . . . elimination of oil and size reduction cuts weight up to 65% at 230 kv; DRASTICALLY SLASHED MAINTENANCE . . . SF_6 does not decompose . . . interrupter easily removed; COMPLETE SAFETY AT ALL TIMES . . . dead tank construction; QUIET OPERATION . . . no discharge to atmosphere . . . closed system conserves gas.



YOU CAN BE SURE...IF IT'S Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV FRIDAYS

New series of tables extended to include larger hourly rates

A NEW SERIES of estimating tables, completely revised in the light of more recent jobs and experience, are presented in this issue and will appear from month to month in forthcoming issues. These electrical estimating data sheets cover labor only and are arranged alphabetically with the basic material headings as a title for each tabulation.

Labor units given in these tabulations are based on a minimum of interference during work progress. The averages listed do not provide for abnormal job conditions, and any such abnormal conditions will require adjustments by the user, based on his experience.

The work units covered by each table are composed of one or more separate but closely related operations necessary for the complete installation of a particular basic item of electrical equipment. These operations associated with the basic material are described at the bottom of each table.

Most of the electrical estimating tabulations follow the same form. Column 1 at the left shows the size of the material to be installed. The second column from the left gives the time required to install the material, and it should be noted especially that this "productivity" column may be based on individual units or in the case of cable or conduit on units of 100 feet or 1,000 feet. The abbreviations "Ea." for each, "C" for hundreds, and "M" for thousands in Column 2 indicate the basis of the labor hours.

Columns 3 to 13, from the left, give the actual labor costs in dollars per unit of installation, at various hourly wage rates.

When calculations are being made for an hourly wage rate that doesn't correspond to any of the rates listed in Columns 3 to 13, the user may multiply the number of hours in Column 2 by 100 and this will give the labor cost based on an hourly wage rate of $1 per hour. By multiplying this by the hourly wage rate that actually applies in the user's locality, the exact labor cost of the operation may be obtained. Labor costs obtained in this way will be for units, hundreds of feet, etc., as given in heading of Column 2 of the table.

The labor units covered by the tables represent direct job labor costs and do not include delivery of material to site, engineering, estimating, or any other indirect cost.

As will be noted, some of the electrical estimating tabulations to be given will be for independent operations, such as excavating, backfilling, etc. These are included for use in preparing estimates on work of a special nature not covered under a specific table heading.

Tables will appear in alphabetical order.

STEEL BOXES - "4 3/8" OCTAGON"
RECESSED SETTING IN CONCRETE
CONDUIT CONNECTED

SIZE 4 OUTLETS EA. Depth	HOURS PER EA.	LABOR COST INSTALLED PER @ FOLLOWING RATES										
		$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75	$4.00	$4.25	$4.50
1½" : ½" - 3/4"	.35	.70	.79	.88	.96	1.05	1.14	1.23	1.31	1.40	1.49	1.58
2" : ½" - 3/4"	.35	.70	.79	.88	.96	1.05	1.14	1.23	1.31	1.40	1.49	1.58
2½" : ½" - 3/4"	.4	.80	.90	1.00	1.10	1.20	1.30	1.40	1.50	1.60	1.70	1.80
3" : ½" - 3/4"	.4	.80	.90	1.00	1.10	1.20	1.30	1.40	1.50	1.60	1.70	1.80
3½" : ½" - 3/4"	.45	.90	1.01	1.13	1.24	1.35	1.46	1.58	1.69	1.80	1.91	2.03
4" : ½" - 3/4"	.45	.90	1.01	1.13	1.24	1.35	1.46	1.58	1.69	1.80	1.91	2.03
5" : ½" - 3/4"	.5	1.00	1.13	1.25	1.38	1.50	1.63	1.75	1.88	2.00	2.13	2.25
6" : ½" - 3/4	.5	1.00	1.13	1.25	1.38	1.50	1.63	1.75	1.88	2.00	2.13	2.25

E-102-B

LABOR INCLUDES: SETTING AND SECURING BOX (NAILING TO FORM) AND MAKING TAPS

12-59

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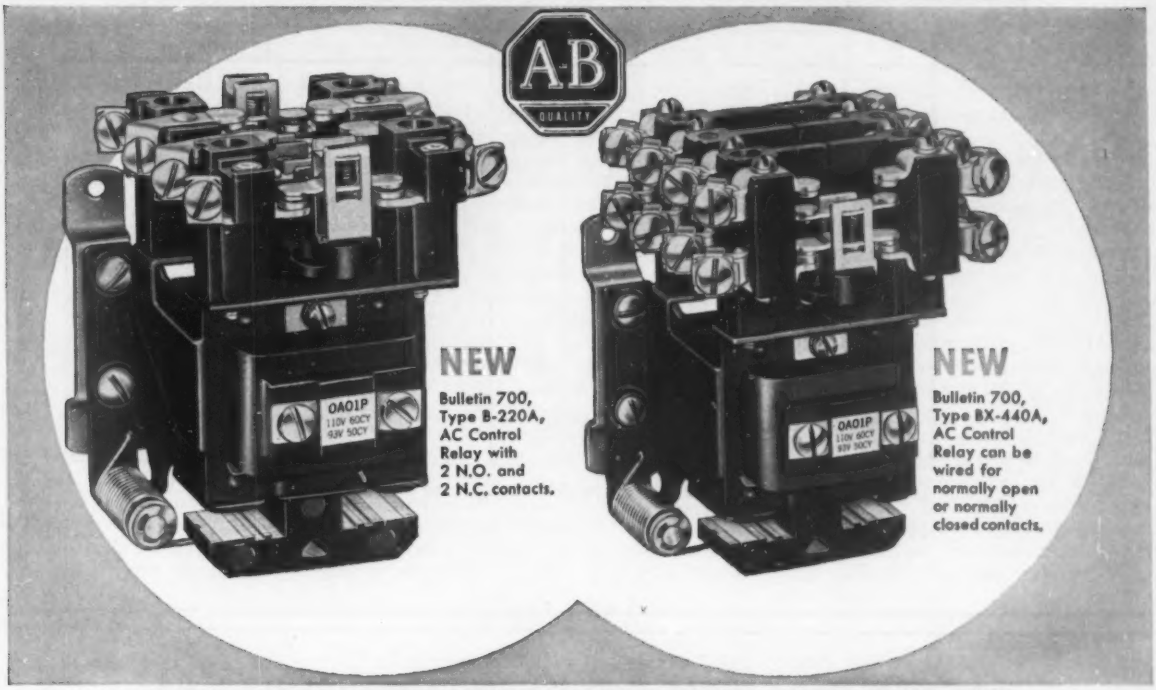
in
Relay Life and Reliability



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Improved features set new performance standards

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- **New contact motion provides 10 times greater electrical reliability.**
- **Complete interchangeability—mounting dimensions are unchanged.**
- **New hermetically sealed plastic coil fits Bulletin 700 relays presently in use.**
- **New, stronger, movable contact crossbar—also fits old relays.**
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STEEL BOXES 4 3/8" OCTAGON
RECESSED SETTING IN CONCRETE
CONDUIT CONNECTED

SIZE 4 EA. OUTLETS Dpth	HOURS EA.	LABOR COST INSTALLED PER 100 FOLLOWING RATES $2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75	$4.00	$4.25	$4.50
3" - 3/4" - 1"	.45	.90	1.01	1.13	1.24	1.35	1.46	1.58	1.69	1.80	1.91	2.03
3½" - 3/4" - 1"	.5	1.00	1.13	1.25	1.38	1.50	1.63	1.75	1.88	2.00	2.13	2.25
4" - 3/4" - 1"	.55	1.10	1.24	1.38	1.51	1.65	1.79	1.93	2.06	2.20	2.34	2.48
5" - 3/4" - 1"	.6	1.20	1.35	1.50	1.65	1.80	1.95	2.10	2.25	2.40	2.55	2.70
6" - 3/4" - 1"	.6	1.20	1.35	1.50	1.65	1.80	1.95	2.10	2.25	2.40	2.55	2.70

E-102-B

LABOR INCLUDES - SETTING AND SECURING BOX (NAILING TO FORM) AND MAKING TAPS

12-59

250 V DC - 440 V AC
HOUSING COVER OPTIONAL

CIRCUIT BREAKING PLUGS AND RECEPTACLES
DEAD END AND BASE MOUNTED
WOOD AND MASONRY
30AMP. - 2 WIRE

SIZE WIRE	POLE	HUB	HOURS EA	LABOR COST INSTALLED PER EA. @ FOLLOWING RATES $2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75	$4.00	$4.25	$4.50
				DEAD END WITH OR WITHOUT CLAMPING NUT.										
2	2	3/4"	.6	1.20	1.35	1.50	1.65	1.80	1.95	2.10	2.25	2.40	2.55	2.70
2	2	1"	.75	1.50	1.69	1.88	2.06	2.25	2.44	2.63	2.81	3.00	3.19	3.38
				WOOD MTD. (4 SHOES) WITH OR WITHOUT CLAMPING NUT.										
2	2	3/4"	.85	1.70	1.91	2.13	2.34	2.55	2.76	2.98	3.19	3.40	3.61	3.83
2	2	1"	1.0	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50
				CONCRETE MTD.(4 SHOES) WITH OR WITHOUT CLAMPING NUT.										
2	2	3/4"	1.1	2.20	2.48	2.75	3.03	3.30	3.58	3.85	4.13	4.40	4.68	4.95
2	2	1"	1.2	2.40	2.70	3.00	3.30	3.60	3.90	4.20	4.50	4.80	5.10	5.40
DIA.	CABLE			TYPE "C P" PLUGS FOR ABOVE - WITH OR WITHOUT CLAMP NUT AND RUBBER BUSHING										
.500	.750		.45	.90	1.01	1.13	1.24	1.35	1.46	1.58	1.69	1.80	1.91	2.03
.750	1.000		.65	1.30	1.46	1.63	1.79	1.95	2.11	2.28	2.44	2.60	2.76	2.93
1.000	1.188		.9	1.80	2.03	2.25	2.48	2.70	2.93	3.15	3.38	3.60	3.83	4.05

E-101-B

GROUNDING - OPTIONAL THROUGH SHELL OR SHELL & EXTRA POLE.
LABOR - INCLUDES DISSASEMBLY, DRILLING & ANCHORING AS REQUIRED ASSEMBLY & SECURING & MAKING CONNECTIONS.

12-59

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Understanding the Code

By Walter R. Stone

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities ✔
- Electrical Wholesalers ✔
- Electrical Inspectors ✔
- Industrial Engineers ✔
- Consulting Engineers ✔

Controversy resolved

◆ BY A SIMPLE CHANGE in wording, Section 230-3 has resolved a long-standing controversy. This section now states, "No overhead service, no underground service and no service from an isolated plant shall supply one building from another, unless such buildings are under single occupancy or management. See Section 230-45." Old Section 2302 formerly stated *through* another building instead of *from*.

Many contractors misunderstood the old wording and, as a result of this misinterpretation, frequently served one building by "bouncing" off the corner of another where a service entrance was installed for both buildings. Or perhaps an existing service on the first building was "tapped" for service to another. This arrangement was usually rejected by the inspector even though the contractor contended that he was not serving the second building *through* the first. The new wording clarifies this so that such misunderstandings should be minimized. It is clear enough, now, that each building must be served independently unless both, or all, are occupied or managed by the same person.

Section 230-45 referred to in the above quoted section, which was formerly included in old Section 2302, states, without change, "Conductors in conduit or duct placed under at least two inches of concrete beneath a building, or buried in two inches of brick masonry or in concrete within a wall shall be considered outside of the building." This reference has a great deal to do with the point of entrance of service conductors in a building, but it has very little to do with serving one building from

Code test question

(These questions have been prepared with a view of bringing out important points on Code changes.)

1. Service overcurrent protection and disconnecting means for metal-enclosed switchgear not exceeding 25,000 volts may consist of air load-interrupter switches and suitable fuses. True or false?

2. Circuit interrupting devices for potentials exceeding 600 volts may consist of load-interrupter switches in conjunction with suitable fuses or circuit breakers. True or false?

3. An underground service may supply one building from another whether or not they are under single occupancy or management. True or false?

4. Two sections of a service raceway which are interrupted by a section of flexible metal conduit containing three No. 1 conductors, and which are required to be bonded, may be bonded by a copper conductor not smaller than No. 8. True or false?

5. Sections of service raceway which are interrupted by a section of flexible metal conduit may be bonded by an aluminum conductor provided that size of aluminum conductor is selected which will have a carrying capacity equal to or greater than the required size of copper conductor. True or false?

6. For a single family residence, the rating of the service equipment shall be not less than:

(a) 60 amperes if the initial load is 10 kw or more when computed in accordance with permissible demand factors.

(b) 100 amperes if the initial load is 10 kw or more when computed in accordance with permissible demand factors.

(c) 100 amperes if the initial load does not exceed 10 kw before the application of permissible demand factors.

Which is correct? a? b? or c?

7. Overcurrent devices installed in residential occupancies are required to be of the time-delay type:

(a) only if plug fuses are used.

(b) only for plug fuses of not over 20-ampere rating.

(c) whether plug fuses, cartridge fuses, or circuit breakers if installed in circuits of 20 amperes or less capacity.

Which is correct? a? b? or c?

8. Ungrounded systems supplying industrial equipment and operating at more than 150 volts and less than 600 volts:

(a) are required to be equipped with ground detectors.

(b) are recommended to be equipped with ground detectors.

(c) are recommended not to be equipped with ground detectors.

Which is true? a? b? or c?

9. In residential occupancies, hedge clippers and lawn mowers:

(a) are required to be grounded.

(b) are recommended to be grounded.

(c) are required to be grounded unless provided with insulating handles.

Which is correct? a? b? or c?

10. Where the only underground water piping system available for system grounding is interrupted with insulated sections:

(a) it should not be used for grounding purposes.

(b) the metallic portion inside the building may be used for the grounding electrode provided that the insulating section is entirely outside the building.

(c) it should be made electrically continuous by bonding around all insulating parts and used for the grounding electrode.

Which is correct? a? b? or c?

Correct answers will be found at end of article on page 104.

another, since conductors, even when run outside of a building for a part of the distance, cannot be used to serve one building from another unless both are under single occupancy or management.

Underground service

Underground services, *if buried directly in the earth*, are no longer permitted to have bare neutrals, regardless of voltage. On the other hand also regardless of voltage, bare neutral *copper* conductors are permitted to be used underground *if installed in duct or conduit*. Both copper *and* a luminum *uninsulated* grounded neutral conductors are permitted to be installed underground if they have a *covering* as a part of an approved cable assembly—again regardless of voltage. The old reference in Section 2303-a to "voltage to ground of not more than 300 volts" has been eliminated. This 300 volt limitation *still applies*, however, for "service entrance conductors *extending along the exterior of or entering buildings*." Section 230-40(a).

Briefly, then, uninsulated neutrals are still limited to services of not more than 300 volts to ground if *not installed underground;* but there is no voltage limitation where such conductors *are* installed underground. Bare neutrals are *not* permitted to be installed in direct contact with the soil. Bare grounded *copper* service neutrals may be used in underground *raceways*. Grounded aluminum underground service conductors, if not insulated, *must be a part of an approved cable assembly*.

A great many contractors, however, consider it prudent to use service neutral conductors which have the same type insulation as the phase conductors, especially in the higher voltages, so that in the event of insulation failure on one of the phase conductors, the neutral can be exchanged with the conductor with the faulty insulation merely by switching them at their terminals. But the greater reliability of the higher quality insulations used on present day conductors results in so few breakdowns, when the conductors are properly installed, that the need for this extra precaution is rapidly becoming obsolete. (Neutral conductors inside of buildings, of course, should have the same insulation as any other current-carrying conductor and, except for one or two exceptions, they are required to be so insulated.)

Bonding conductor

The bonding conductor around a section of flexible metal conduit where installed in, and as a part of, a service raceway is now required by Section 230-63(c) to be "not smaller than that specified for grounding conductors in Table 250-94(a)". Old Section 2382-c required this bonding conductor to be "not smaller than No. 8". This change will eliminate much confusion, since a great many contractors interpreted this old section to mean that No. 8 was acceptable for *any* size service, while many inspectors interpreted it to mean a *minimum* size only.

Some of these inspectors required bonding wire sizes in accordance with the table in old Section 2594-a (new Table 250-94-a) and some in accordance with the table in old Section 2595 (new Table 250-95) with No. 8 being the minimum size permitted. The new requirement specifying that the size must be in accordance with the sizes listed in a specific table will be welcomed by both contractors and inspectors.

Copper wire is still specified for this bonding conductor with no provisions having been included for an aluminum conductor with equivalent carrying capacity. Contractors should note this well to prevent getting involved in controversies over this phase of the section.

Any contractor who has a definite preference for using aluminum for this purpose should at least query the local inspection authority before making the installation to determine whether he will permit this exception to the Code rule. Most inspectors, presumably, will insist that the Code requirement for copper be adhered to for steel raceways if not for aluminum.

Section 230-102 is entirely new and states, "Warning Signs. High voltage signs shall be posted where unauthorized persons might come in contact with live parts." This section is under the general heading of, and applies only to, services exceeding 600 volts.

Load-interrupter switches

Another significant change has been made for services exceeding 600 volts by the new provisions of Section 230-106(a)(2). This section now qualifies the nonautomatic switch previously permitted by specifying that it must be an *oil* switch for a potential of not over 25,000 volts and recognizes for the first time the use of an "air load-interrupter switch or other approved switches" for this voltage in conjunction with suitable fuses. This section refers to the use of such devices when enclosed in a vault or when in metal-enclosed switchgear. As changed, this section now states, "Where the voltage is 25,000 or less, a non-automatic oil switch, an air load-interrupter switch, or other approved switches, capable of interrupting the rated circuit load and suitable fuses may be used."

Section 230-106(b)(1) states almost the same thing and is also under the same heading but extends the use for mounting on poles outside. It states, "Circuits of not over 25,000 volts, air load-interrupter switches or other approved switches, capable of interrupting the rated circuit load may be used with suitable fuses on a pole outside the building."

Interrupters discussed in 710

Article 710 of the new Code (Over 600 Volts—General) also mentions load interrupters and provides, in addition, new requirements for warning signs unless switching devices are interlocked with an approved switch or contactor which is capable of interrupting the total load. These new provisions are stated as follows:

Section 710-21(b)(3) "When high voltage fused cutouts are installed in a building or a transformer vault, they shall be of a type designed for use in buildings. Where such cutouts are not suitable to interrupt the circuit manually while carrying full load, an approved switch or contactor shall be provided which is capable of interrupting the entire load. In addition, the circuits shall be interlocked with the approved interrupter or bear a conspicuous sign reading, 'Do Not Open Cutout Under Load.'

"The cutouts shall be so located that they may be readily and safely operated and re-fused. Fuses shall be accessible from a clear floor space."

Section 710-21(c) states, "Load Interrupters. Load interrupter switches may be used providing suitable fuses or circuit breakers are applied in conjunction with these devices to interrupt fault currents. When these devices are used in combination they shall be so coordinated electrically that they will safely withstand the ef-

fects of closing, carrying or interrupting all possible currents up to the assigned maximum short circuit rating."

Already in restricted use

Of course, load interrupter switches are now in restricted use in thousands of industrial plants already. The Code recognition of these devices will remove the restrictions provided that they are used in conjunction with the Code required fuses or circuit breakers to interrupt fault currents. (See Figure 1).

An ideal arrangement, from a safety standpoint, in the opinion of many system engineers is a power circuit breaker for each individual load center or substation. Such an installation, of course, is extremely expensive to install. To avoid this heavy initial expense, engineers have in many cases specified the use of load interrupter switches. The new Code recognition of load interrupter switches, in conjunction with fuses, amounts to a practical solution to this problem, since such load interrupters are relatively economical to install and, at the same time, they provide adequate safety.

Under conditions where primary overcurrent protection was not required by the Code for each individual transformer, interrupter switches frequently have been used in the past because of the convenience of the isolating factor which was provided by their use. Section 450-3(b) states, "A transformer having an overcurrent device in the secondary connection, rated or set at not more than 250 per cent of the rated secondary current of the transformer, or a transformer equipped with a coordinated thermal overload protection by the manufacturer, is not required to have an individual overcurrent device in the primary connection provided the primary feeder overcurrent device is rated or set to open at a current value not more than six times the rated current of the transformer for transformers having not more than six per cent impedance, and not more than four times rated current of the transformer for transformers having more than six but not more than ten per cent impedance."

Referring again to Figure 1, where the primary feeder overcurrent device (A) does not exceed six times the rating of any

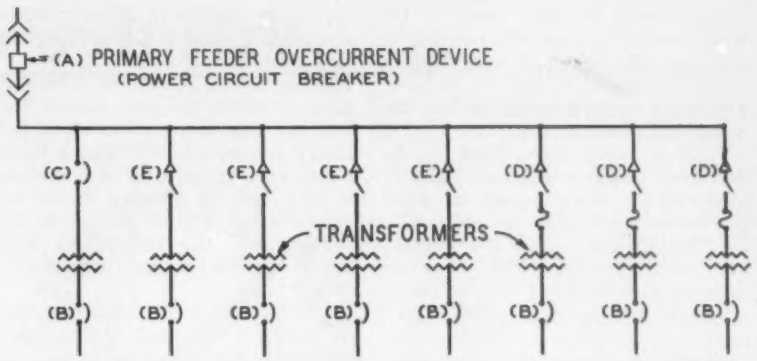

Fig. 1—Load interrupters formerly used without fuses in a restricted manner as shown at (E) above are now permitted by the Code when used in conjunction with fuses as shown at (D). The items indicated above are: (A) primary feeder power circuit breaker; (B) secondary circuit breakers; (C) individual primary circuit breakers; (D) load interrupter switches with fuses; and (E) load interrupters without fuses.

one of the connected transformers having not more than six per cent impedance (or four times this rating for transformers having not more than ten per cent impedance) and where the secondary overcurrent devices (B) do not exceed 250 per cent of its individual transformer rating, no primary overcurrent device (C) is required by the Code for each individual transformer.

This permits the feeder primary overcurrent device (A) to function on short-circuits while the secondary overcurrent devices (B) protect from overloads. But where diversity in loads does not permit operation at this setting of the feeder over-current device (A) without nuisance tripping, additional overcurrent protection must be provided at the individual primaries (C) in order to permit an increase in the current setting of the feeder overcurrent device (A).

By the provisions of the new Code rules, load interrupter switches and fuses (D) are now acceptable for this purpose. Such interrupters without fuses (E) were often used anyway at these points for the extra convenience of the isolating factor provided by them even when the feeder primary overcurrent device (A) did meet Code requirements without the use of additional individual primary overcurrent devices.

Overcurrent protection changes

Article 240—Overcurrent Protection—has several Code changes. Section 240-2 (old Section 2401) has had two words, *and equipment*, added to its first sentence, and the second sentence has been deleted. It now states, "Purpose of Overcurrent Protection. Overcurrent protection for conductors *and equipment* is provided for the purpose of opening the electric circuit if the current reaches a value which will cause an excessive or dangerous temperature in the conductor or conductor insulation." (The added italics indicate the words which are new.) This addition corrects an oversight in previous editions of the Code.

The sentence which has been deleted from the new Code did state, "A grounded conductor is considered to be protected from overcurrent if a protective device of a suitable rating or setting is provided in each ungrounded conductor of the same circuit." It is the custom of the Code, generally, to list only the required rules and not to explain why certain requirements are listed or why certain other actions may not be required. Therefore, this sentence was deleted in conformity with this general practice.

The protection which is thus afforded such grounded conductors by overcurrent devices which are placed in the ungrounded conductors of the same circuit is still implied, however, by the provisions of Table 240-28 which lists the conductors in which overcurrent devices are required for various types of circuits.

Section 240-4 requires *all* overcurrent devices to be of the time-delay type when installed in circuits of 20 amperes or less in residential occupancies. This formerly was a recommendation only and

applied only to plug fuses. It is now mandatory for all over-current devices, whether plug fuses, cartridge fuses, or circuit breakers, of 20 ampere rating or less in residential occupancies.

Section 240-5, Exceptions No. 1 and No. 2, have become slightly more strict as a result of the standard manufacture of additional "in-between" sizes for fuses and circuit breakers. The old permissible maximum of 150 per cent oversize has been deleted. The next higher standard size must be used as the maximum when the allowable current carrying capacity of a conductor slightly exceeds the nearest rating of an overcurrent device. Many ad-

(Continued on page 103)

Questions on the Code

(Readers are invited to send in questions which they would like to see discussed in this department.)

Number of wires permitted in box

QUESTION: In regard to the number of conductors permitted in a box when there are clamps, devices, etc., also in the box, it's not clear to me just how many deductions are to be made. If I am using No. 12 wire in a 2 x 1¾ x 2¾ switch box and the box contains one switch (or plug) and two clamps (one at each end) would that leave only one wire permitted in the box? And I am not sure what is meant by several devices mounted on the same strap. I would like to have this discussed.

ANSWER: Section 370-6-a states, "The maximum number of conductors, not counting fixture wires, permitted in outlet and junction boxes shall be as in Tables 370-6(a-1 and -2) with the exceptions noted."

The two tables referred to are then followed by this paragraph: "Tables 370-6(a-1 and -2) apply where no fittings or devices, such as fixture studs, cable clamps, hickeys, switches or receptacles are contained in the box. Where *one or more* fixture studs, cable clamps, or hickeys are contained in the box, the number of conductors shall be *one less* than shown in the Tables, with a *further reduction of one* conductor for *one or several* flush devices *mounted on the same strap.* A conductor running through the box is counted as one conductor and each conductor originating outside the box and terminating inside the box is counted as one conductor. Conductors of which no part leaves the box are not to be counted in the above computation. If single flush boxes are ganged, and each section is occupied by a flush device or combination of flush devices on the same strap, the limitations will apply to each section individually."

Italics have been added to aid in pointing out these points: (a) Only *one* wire is deducted for *all* of the fixture studs, cable clamps, or hickeys in a box; (b) only *one additional* wire is deducted for one device or for a *group of devices* mounted on the *same strap.* So that *two* wires, instead of only one, would be permitted in the box which you mentioned with your specified two clamps and one device (switch or receptacle). The table lists four for such a box with no fittings or devices. Four minus one for the two clamps and minus an additional one for the device leaves two.

By the term "several flush devices mounted on the same strap" is meant such combinations as two Despard type switches or one Despard type switch and a pilot light or one Despard type switch and a receptacle on a single yoke.

Wiring in dwellings for neon tube lighting

QUESTION: My customer, who is building a large housing project, wants neon tubing cove lighting in a good many of the houses in this project. In the first one I wired, I had to run some of the neon secondary wiring inside of a wall. But the inspector turned this down. I do not see any way to keep all of the secondaries exposed and still make a decent looking job of it. I had these conductors in leaded glass tubing. What is the violation here? The transformers are only 12,000 volts.

ANSWER: This is a violation of Section 600-31(e) of the new Code which is identical to the old Section 6031-e of the 1956 Code. This section which covers signs and outline lighting circuits in excess of 600 volts states, "Concealed Conductors on Insulators — Indoors. Concealed conductors on insulators shall be separated from each other and from all other objects other than the insulators on which they are mounted by a spacing of not less than 1½ inches for voltages above 10,000 volts, and not less than 1 inch for voltages of 10,000 or less. They shall be installed in channels lined with noncombustible material and used for no other purpose, except that the primary circuit conductors may be in the same channel. The insulators shall be of noncombustible, nonabsorptive material."

Note that the required clearance within the channel is 1½ inches for voltages exceeding 10,000, and 1 inch for voltages of 10,000 or less, but that the channel, itself, is required for both of these catagories.

You stated that you had used glass tubing for the purpose of enclosing the conductors. Of course, glass is very good insulation. But it is subject to physical damage, especially when installed in walls under construction. Section 600-31(a) states, "Wiring Method. Conductors shall be installed as open work, as concealed conductors on insulators, in rigid or flexible metal conduit, or in electrical metallic tubing." Glass raceways are not included as an acceptable wiring method. And for the "concealed conductors on insulators" the additional restrictions of the channel, which we quoted above, are reqiured.

Important reference

Do not overlook Section 600-32(b) which, beginning with the third paragraph, states, "Transformers for outline lighting installations shall have secondary current ratings not in excess of 30 milliamperes except where they and all wiring connected to them are installed in accordance with the provisions of Article 410 for electric discharge lighting of the same voltage." You said that your voltage was 12,000. Section 410-73(a) of Article 410 states, "Equipment having an open-circuit voltage of more than 1,000 volts shall not be installed in dwelling occupancies." So be sure to use transformers which do not exceed 30 milliamperes, because if you do, the inspector will no longer judge the installation by the rules of outline lighting in Article 600. He will judge it by Article 410.

As for the concealed conductors, it might be possible for the builder to include space in the cove for mounting the transformers so that there will be no need to run the secondary conductors inside of concealed wall spaces.

News of the industry

edited for Southern readers

Exposition to feature "climate-conditioning"

EXHIBITS at the 2nd Southwest Heating & Air-Conditioning Exposition will feature equipment adapted to the climate of the southwest thereby demonstrating one of the great growth factors of the industries represented.

Above normal temperatures are characteristic of the southwestern climate and the Exposition will present, among other innovations, new adaptations of evaporative cooling. By contrast, sudden dips into the lows produce a sharply defined, intermittent heating problem, and the year-round air-conditioning system, as typified by the heat pump, will be a significant feature of the display, as will many supplementary heating units.

The Exposition will be held at the Dallas Memorial Auditorium, February 1 to 4, 1960, under the auspices of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, in conjunction with its meeting there. Exhibitors representing the full scope of the heating and air conditioning industry have been drawn from all parts of the country. Attendance will be national and will include many visitors from foreign countries.

New theme and emblem for electric industry

A NEW OVER-ALL theme and emblem—"Keep Pace Electrically"—designed to promote and sell electrical equipment in the commercial market, was introduced to manufacturers and allied associates last month at the 33rd Annual Meeting of the National Electrical Manufacturers Association, in Atlantic City.

Concurrently, the emblem was being unveiled at the 58th Anniversary Convention of the National Electrical Contractors Association, in Miami Beach, Fla.

The new concept, developed by the National Wiring Bureau as the commercial counterpart to the "Live Better Electrically" program in the residential field, was announced by Lester E. Barrett, president of Barrett Electrical Supply Company, St. Louis, Mo., and chairman of the National Wiring Bureau.

"The under-lit, under-powered, under-wired commercial market," said Mr. Barrett, "cries out for a common focal point, behind which all branches of the electrical industry can rally, as they have behind 'Live Better Electrically' in the residential market."

This new emblem has been introduced for use of the industry.

He pointed out that for utilities, "Keep Pace Electrically" will spotlight electricity as the most economical and efficient way for commercial, industrial and institutional users to keep pace with the ever-expanding needs of a growing economy.

For manufacturers of utilization devices, Mr. Barrett emphasized the new theme as a way to step up profits, production, efficiency and learning. For manufacturers of construction materials, he said it will focus prospects attention on the electrical content of their plans to remodel or to build as they grow with their market. And for electrical contractors, he said it will provide a central focus for their selling efforts to commercial customers, linking their individual companies to a nationally-advertised program.

National advertising, Mr. Barrett announced, would begin during National Electrical Week, February 7-13, 1960. Full pages will appear in *Business Week* and in *Fortune*, paid for by the National Electrical Contractors Association.

The National Wiring Bureau, he said, will use small ads throughout the year in customer trade magazines having a circulation of 13 million. The Bureau will make available tie-in promotional literature for various types of commercial establishments.

Power company holds heating exhibitions

TO HELP builders, architects, engineers, and contractors better understand the advantages of electric space heating, and to give the general public an inside view of how it can benefit them, the Mississippi Power and Light Company recently presented a series of four exhibitions and programs on the subject.

Held in Jackson, Greenville, Brookhaven, and Grenada, Miss., the exhibitions covered a period of five days each, and featured special dinners and market progress reports for those in the electrical fields.

House of Ideas shows electrical innovations

OVER 50 per cent of homes in the Parade of Homes held recently in Oklahoma City were Medallion homes, but the one drawing the greatest traffic was a home full of new ideas.

Carpenter Electric Company had the contract on the much-publicized asbestos-cement research house, first to be built under the Basic Materials Research and Design Program, (spearheaded by *Living for Young Homemakers* magazine). Designed by R. Duane Conner, and built by Joel Coley, the unusual appearance attracted many visitors. The vaulted roof, made of arched panels sandwiched with foam cement for insulation, the asbestos cement wall panels, the free use of glass—all made the house an eye-catcher for many thousands. But the lighting effects and imaginative use of electrical appliances rated right along with other details in comment from visitors.

High on the excitement list was an "island" between kitchen and living area—on one side a contemporary fireplace, on the other side an electric range. Both use the same flue, and the exhaust fan over the range also serves as a "pull" for the fireplace.

Margeruite Borelli, OG&E lighting director, was on hand to explain the efficiency of the all-electric kitchen which featured built-in freezer and refrigerator, garbage disposal, deluxe oven with rotisserie, dishwasher, combined washer-dryer.

Interesting lighting details included counter lighting which allows the housewife to work without shadow. Fluorescent tubes with shelf enclosure are used over all work counters. Ranking right along with the fireplace-range in comment from visitors was the concealed lighting from asbestos cement beams, centralized switches, and the absence of decorative fixtures in the house. Heavy use was made of modernistic

Island between living area and kitchen includes fireplace backed up with electric range. Exhaust fan over range also provides draft for fireplace. Indirect lighting and absence of visible lighting fixtures, and several outdoor units, are features of lighting in this show home.

commercial fixtures on exterior—on the back of the house, at patio area, and on garage.

Edward Carpenter and his two electricians on this job, said the job was more nearly like a commercial installation. Rigid conduit, 1¼", carried feed through top-recessed center beam, junctioned at each of the four asbestos-cement posts. Pull boxes were set in cement, and the numbered and lettered boxes were set one to each beam crossing the center beam. Trough-recessed lighting units were mounted from the top of each beam. Conduit was used in the floor across house from panel to kitchen area, where pull boxes were located behing the dishwasher and in an outside corner of the fireplace masonry. Carpenter points out that ample use of brick is necessary for this kind of installation near heat.

All switches were placed on a panel at the living room wall, except for a switch at the front door, regular switches at bath and closets and one or two others. Luminous bathroom ceilings, by use of plastic panels, carried out the indirect lighting, no-fixture scheme.

Carpenter realizes the value of being associated with such experimental projects, not only from the high word-of-mouth publicity value, but from the challenge in such jobs which makes him and his men better able to solve any electrical problem.

Summing up his experience on this job, he said he believed use of conduit in the wall, built in as the asbestos-cement panel is cast, would be a good answer to such future buildings.

Steinmetz becomes head of Anaconda company

RICHARD B. STEINMETZ has been elected president of Anaconda Wire & Cable Co., a 70%-owned subsidiary of The Anaconda Co., Mr. Steinmetz, who has been associated with the Anaconda organization since 1929, and who has been executive vice-president since 1957, succeeds William E. Sprackling who is now retiring. Mr. Sprackling will remain as a director of the subsidiary.

Richard B. Steinmetz

A native of Washington, D. C., Mr. Steinmetz is an electrical engineering graduate of Cornell, class of 1922. His early years with the company were spent in electrical engineering assignments and as a district sales engineer in several major cities. In succeeding advancements Mr. Steinmetz became general manager of all mills in 1951; vice-president in charge of manufacturing operations in 1952, the post he held until named executive vice-president in 1957.

Georgia power dedicates Oliver Dam at Columbus

DEDICATION ceremonies for the new $14,500,000 dam and hydroelectric generating plant on the Chattahoochee River, at Columbus, Ga., were climaxed with speeches by Georgia's Governor Ernest Vandiver, two U.S. Congressmen, and the chairman of the Georgia Inland Waterways Commission.

Rising 70 feet high, the new Oliver Dam spans a length of 2,021 feet, and includes a 2,400-acre reservoir, now available for fishing, boating, and water skiing. The plant's four turbines can produce 255 million kilowatt hours a year, or enough electricity to supply the needs of 65,000 average homes.

Georgia Rep. E. L. Forrester, Alabama Rep. George W. Andrews, and J. W. Woodruff, Sr., chairman of the Georgia Inland Waterways Commission, all helped dedicate the dam, which was built by the Georgia Power Company and named for James M. Oliver, former vice-president and general manager of the company.

Electrical show will feature new products

NEW PRODUCTS for today's highly powered electric market will be spotlighted at the Fifth National Electrical Industries Show, slated for March 6-9, in the New York Coliseum. Also featured during the showing will be an animated educational display tracing an eighty-year span from Edison's first use of electricity to today's electricity by atomic reactor.

The four day display will show such developments as hand held diamond drill units; an all new drive tool with which telephone and communication companies everywhere can fasten without drilling, plugging, or use of explosives; a new type relay good for 75 million operations; and a new power distribution system for use in industrial plants and commercial buildings.

Sponsored by the Eastern Electrical Wholesalers Association (EEWA), the four day show is open to the electrical industry and allied trades by invitation only. However, invitations are still available through Harold R. Meyer, American Electrical Industries Exposition, Inc., 550 Fifth Avenue, New York 36, N. Y., producers of the show.

3E appoints Deal new manager of marketing

THE 3E COMPANY, subsidiary of the Hubbard Co., Melrose Park, Illinois, announces the appointment of Robert E. Deal as manager of marketing.

Formerly with Line Material Industries of Atlanta, Ga., for five years, and with the power company, in Charlotte, N. C. for six years, Mr. Deal comes to 3E with an extensive background in the electrical apparatus field. He is a graduate electrical engineer, with a degree from University of Tennessee.

The 3E Company manufactures indoor and outdoor switches, switch controls, metal enclosed switch gear and outdoor substations.

Date set for annual relay conference

THE 13TH ANNUAL conference for protective relay engineers has been set for April 11-13, 1960, at the Department of Electrical Engineering, A & M College of Texas, College Station, Texas. For additional details, write L. M. Haupt, conference chairman.

Thirteen "grads" finish electric heating school

THIRTEEN representatives of electric space heating firms have graduated from a special school conducted by Duke Power Company at its Anderson, S. C., office. In addition to learning the latest and best techniques for the design and application of electric comfort heating in residences, the men heard a report on the rapid acceptance of electricity for heating and user satisfaction.

To obtain their certificates, the 13 men attended a two-hour class each week for five weeks, according to A. M. Doolittle, Duke manager in Anderson. They studied the different types of residential electric comfort heating equipment, how to apply and wire it properly, how to calculate the operating costs under the new, low all-electric rate, and the value of insulating a home fully.

During the five weeks, representatives of Duke and Jack Baker, of Robbins and Myers, manufacturer of electric comfort heating equipment, presented material and answered questions. Aiding these men was Arthur Madden, Anderson residential heating specialist for Duke Power Company.

Graduates of a Duke Power Company-sponsored school in electric heating are shown at a dinner climaxing the successful completion of the course in Anderson, S. C. The course covered a five-week period.

The 13 graduates are George Harper of Sullivan Hardware; Carroll Maxwell of Maxwell Electric Co.; Richard Magnussen, of Wholesale Electric Supply; George Milford, of Milford Electric Co.; W. S. Smith, of Wholesale Electric Supply; C. R. McClure, of Piedmont Electric Wholesalers; R. F. Tollison and George Tripp, of City Electric Company; W. B. Baker, Jr., of Wholesale Electric Supply; Charles Gaillard, of Sullivan Hardware; Brantley Jordan, Jr., of Jordan Electric Co.; Robert L. Hill, of Hill Electric Co.; and William O. Ducworth, of J. Roy Martin Co.

At the graduating ceremonies, James M. Foreman, supervisor of residential promotion for Duke, said that "electric comfort heating is being accepted very rapidly in the Piedmont Carolinas for both new and existing homes. The number of installations made since the first of 1959 is almost twice as many as existed previously on the Duke Power system."

Mr. Foreman also said that "about 10 per cent of all new homes now have electric comfort heating, and a large percentage of existing homes are switching to it as old furnace systems wear out.

"The reason for the rapid acceptance," Mr. Foreman continued, "is that electric comfort heating offers the users many exclusive benefits. Not only is it reasonable in cost, but electric comfort heating is the cleanest form of heat because there is no smoke or soot from the burning of fuel. Also, it is practically free of trouble because there is nothing to wear out such as burners and flues. The only moving parts in ceiling, floor, and baseboard installations are in the reliable standard thermostats."

Owners of homes having electric heating panels are highly satisfied, reported Mr. Foreman. For example, he said, well over 90 per cent of these owners in North Carolina alone are willing to recommend the system.

New chief engineer at Anderson Electric

THURMAN L. RUNDLETT has joined Anderson Electric Corporation, Birmingham, Alabama, as chief engineer,

T. L. Rundlett

John H. Schuler, executive vice-president and general manager, has announced.

Before coming to Anderson, Mr. Rundlett was division engineering manager of Westinghouse Electric Corporation's Air Conditioning Division in Staunton, Virginia. He is a graduate of Colgate University, holds a master's degree from Duke University, and has done graduate work at the University of Pittsburgh.

Seven IAEI chapters plan joint meeting

DISCUSSIONS of the National Electrical Code will be the primary focal point of the Joint Seven Chapter Meeting of International Association of Electrical Inspectors, to be held May 6-7, 1960.

The meeting, which will include North Louisiana-East Texas, Baton Rouge, George Welman, Sabine, Texas Gulf Coast, North Central Division, and Texas Chapters, will be held in the Hotel Marshall, Marshall, Texas.

Because it deals with the code, this meeting is open to everyone connected with the electrical industry.

G-E head looks forward to electrical growth

THE ELECTRICAL industry will continue its historical pattern of growing faster than the national economy as a whole, predicted Ralph J. Cordiner, chairman of the board of General Electric Co. He was speaking at a dinner honoring the G-E Board of Directors.

Mr. Cordiner estimated that the industry's output could rise from its present approximately $20 billion a year level to $44 billion by 1966, and to $90 billion by 1976. He also said General Electric could increase its share of the field from the present four-billion-dollar level to six-billion-dollars a year in the early 1960.

The speaker called such goals "realistic," but warned that competition will be increasingly on an international scale, with foreign competitors having some decided advantages, particularly in terms of wage and material costs.

His optimism for the future is based in part on the fact that "in the United States, as elsewhere, the use of electricity is geared not only to population growth, but also to advances in the level of living," Mr. Cordiner said. He also cited the nation's extensive investment in scientific research and development as one of the chief accelerators of economic progress.

Steel City Electric makes sales promotions

A SERIES of promotions, resulting in reorganization of the sales department, has been announced by W. H. Satterfield, sales vice-president for Steel City Electric Co., Pittsburgh, Pa.

R. B. Mitchell

R. B. Mitchell has been appointed manager, distributor sales. G. W. Bickerstaff is now manager, contractor sales and specifications. Norman A. Pemberton, 23 year veteran, has been assigned the responsibilities of advertising, publicity and sales promotion. Anthony A. Goodchild has been appointed manager, slotted angle sales.

James R. Kearney, Jr.

JAMES R. KEARNEY, Jr., president of the James R. Kearney Corp., of St. Louis, died October 16, 1959. Mr. Kearney had been associated with the electrical utility firm since his graduation from the University of Missouri, in 1926. He became president of the company in 1940. His father, who died 10 years ago, founded the firm.

Mr. Kearney was a past president of the National Industrial Advertising Association and the Industrial Marketing Club.

Manufacturers appoint new representatives

FEEDRAIL Corporation, New York, N. Y., has appointed Murray C. Nelson, as representative. His territory will be Virginia, District of Columbia, Maryland east of and including the County of Washington, and the Counties of Berkeley and Jefferson in West Virginia. Mr. Nelson's offices are located at 500 Kingston Road, Baltimore 29, Md.

(Continued on page 92-A)

UTILITY COMMISSIONERS BACK IN SCHOOL— Thirty utility commission executives, representing states from Washington to Florida, attended a short course at Georgia Institute of Technology, sponored jointly by the Institute and the National Association of Railroad and Utility Commissioners. The two week course included such topics as general management, economics, industrial relations, utility accounting, public utility regulation, public relations, decision making, and personal development.

Dates Ahead

2nd Southwest Heating and Air Conditioning Exposition, Memorial Auditorium, Dallas, Texas, Feb. 1-4, 1960.

Missouri Valley Electric Association, Industrial and Commercial Sales Conference, President Hotel, Kansas City, Mo., Feb. 8-9, 1960.

National Electrical Industries Show, New York Coliseum, New York City, N. Y., March 6-9, 1960.

1st National Electric House Heating Exposition, Sherman Hotel, Chicago, Ill., March 21-23, 1960.

Southeastern Electric Exchange, Annual Conference, Boca Raton Hotel and Club, Boca Raton, Fla., March 21-23, 1960.

Virginia Chapter, IAEI, Mariner Hotel, Virginia Beach, Va., April 4-5, 1960.

Southeastern Electric Exchange, Engineering and Operation Section Conference, Roosevelt Hotel, New Orleans, La., Apr. 7-8, 1960.

Protective Relay Conference, Texas A & M College, College Station, Tex., April 11-13, 1960.

Ellis Cannady Chapter, IAEI, Carolina Hotel, Raleigh, N. C., April 12-13, 1960.

Missouri Valley Electric Association, Engineering Conference, President Hotel and Municipal Auditorium, Kansas City, Mo. Apr. 20-22, 1960.

Alabama Chapter, IAEI, (Hotel and date to be announced later) Mobile, Ala.

Tennessee Chapter, IAEI, Andrew Jackson Hotel, Nashville, Tenn., May 2-3, 1960.

Florida Chapter, IAEI, George Washington Hotel, West Palm Beach, Fla., May 5-7, 1960.

Texas-Louisiana Joint Meeting, IAEI, Seven Chapters, Hotel Marshall, Marshall, Texas, May 6-7, 1960.

Georgia-South Carolina Chapters Joint Meeting, (Hotel to be announced later) Savannah, Ga., May 9-10, 1960.

"I'M LOOKING AT A PEEP SHOW THAT SPARES THE POCKETBOOK! IT'S THE BIG NEWS COMING YOUR WAY FROM THE ORIGINATORS OF 5/8% STEP REGULATORS!"
LOOK FOR BIG NEWS COMING FROM THE ORIGINATORS OF 5/8% STEP REGULATORS
ALLIS-CHALMERS
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Ventilate and Heat that manhole
Safely
with a
MODEL PE
UL listed
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VENTILATING HEATER
Fresh Air... heated fresh air in one portable unit!
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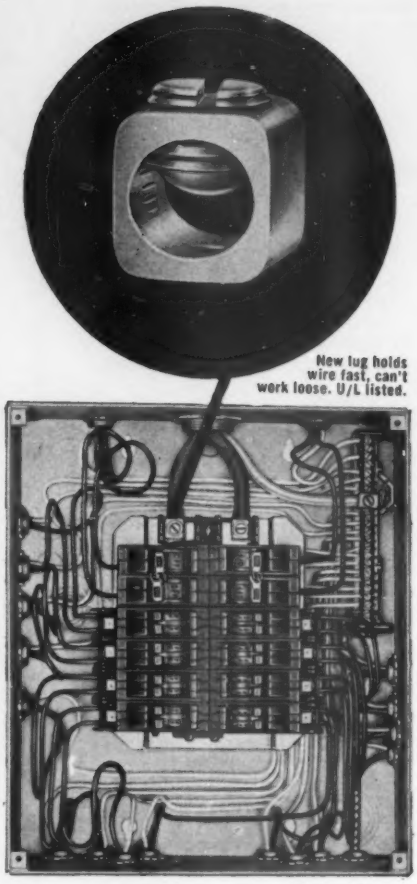
NEW! LUGS FOR BOTH COPPER AND ALUMINUM WIRE

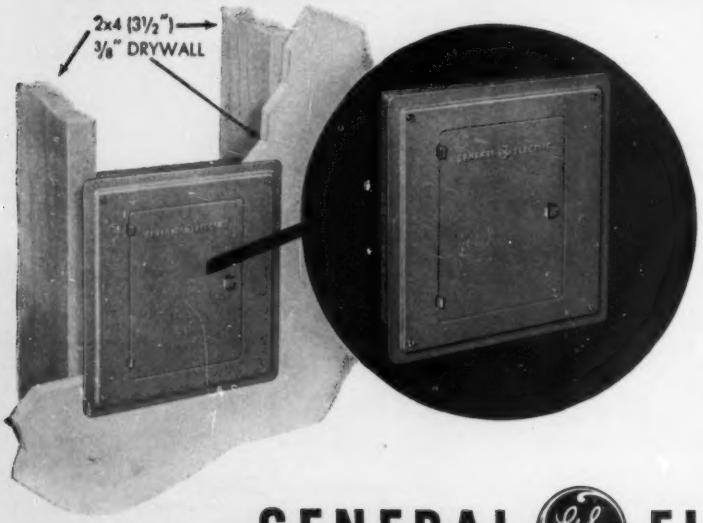


All General Electric load centers (100† and 200 amp.) and fuse pullers (100 amp.) are now U/L listed for both copper and aluminum wire—thanks to the new lug shown above which is standard on these devices *at no extra cost.*

Add this feature to the many advantages of G.E.'s new "twin" breakers and you'll see why more and more contractors are switching to General Electric for highest quality at the lowest cost. The "twin"* lets you put two quality breakers in the space you usually take for one, use a smaller load center, and realize big savings on every job.

† Except TRM Series *Trade-Mark

New G-E flush-front load centers fit flush even with 3/8" drywall



Here is a complete new line of flush-mounted General Electric "twin" load centers to answer your demands for equipment which fits flush with 2" x 4" studs and ⅜" drywall construction.

Ask your G-E distributor to show you the new *flush-front* load centers. Like all General Electric load centers, they feature Snap-Out interiors and provide automatic front alignment—even if the box is installed slightly off plumb.

GENERAL ELECTRIC

Circuit Protective Devices Dept., Plainville, Conn.

MURRAY Manufacturing Corporation announces the appointment of Russell L. Stewart as district sales representative for the states of Kansas, Nebraska and Western Missouri. Sales office for the district will be located in Kansas City, Missouri.

* * *

PFAFF & KENDALL, Newark, N. J., announces the appointment of William B. Gile & Associates as exclusive sales representatives for North and South Carolina. The organization,

Wm. B. Gile

which makes its headquarters in Charlotte, is headed by William B. Gile, who has been a manufacturers' representative since 1948. He is a graduate of New York University.

* * *

THE ELECTRICAL Products Division of the Joy Manufacturing Co., St. Louis, Mo., has assigned Robert Favez to the St. Louis territory. Previous employment has included the National Electric Service Co., as sales engineer; General Electric Co., as sales engineer's assistant in Apparatus Sales; and various other sales correspondent jobs. Mr. Favez is a native of St. Louis.

* * *

WARD LEONARD Electric Co., Mount Vernon, N. Y., announces the recent appointment of Charles B. Durling as district manager of the Chicago office.

Further appointments are: W. L. Patton as district manager of Ward Leonard's Pittsburgh office and Robert Peterson as St. Louis district manager.

* * *

BEN BLACKBURN, executive vice president of Texoma Enterprises, Inc., Sherman, Texas, manufacturers of Jaques hydraulic earth augers, has announced the appointment of Osgood and Associates, Inc., Atlanta, Ga., and R. C. Hauk, Matairie, La.

Osgood and Associates, Inc., has been assigned the territories of Alabama, Georgia, and Florida; R. C. Hauk will represent Texoma in Mississippi and Louisiana.

"HE'S IN FOR A MIGHTY BIG SURPRISE WHEN HE FINDS OUT HOW MUCH EASIER INSTALLATION CAN BE... AFTER THEY UNLOAD A TRUCKFUL OF GOOD NEWS FROM THE ORIGINATORS OF 5/8% STEP REGULATORS!"
LOOK FOR BIG NEWS COMING FROM THE ORIGINATORS OF 5/8% STEP REGULATORS
ALLIS-CHALMERS
A-1196

Latrobe PRODUCTS

FLOOR BOXES · WIRING SPECIALTIES

SIMPLE — FAST EASY WIRING

This "TRU-LEVEL" fully adjustable, watertight, steel floor box assures accurate leveling, easy inside conduit attachment and fast installation.

2½" long screw legs and ½" adjusting ring makes for quick and easy tru-leveling.

Large opening for the hand to fit into enables inside attachment of conduit without removing box body cover. Nine K O's to take care of any size wiring.

Listed under re-examination services Underwriters Laboratories, Inc.

LATROBE PRODUCTS

Non-Adjustable Floor Boxes • Adjustable Floor Boxes • Gang Boxes • Cover Plates • Junction Boxes • Nozzles • Pipe or Conduit Hangers • Insulator Supports • Cable Supports • Fish Wire Staple & Cable Clips

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Write or phone for full details

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Ask for name of nearest distributor

TRUCK Equipment COMPANY

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NED NORWORTH of Memphis, Tenn., has been appointed sales representative for Lightolier Incorporated, Jersey City, N. J. Formerly a representative for General Cable Co., Norworth will service all Lightolier accounts in Central Tennessee, Arkansas, Northern Mississippi, and part of Alabama.

• • •

A NEW SOUTHWESTERN merchandise sales region was established by Emerson Electric Mfg. Co., recently, according to announcement by Dick Loynd, merchandise sales manager.

Jack Rogers, who has a 20-year sales experience background with the company, was appointed regional sales manager for the new area. Bill Richard, who has five years' company experience in the lighting field, was named lighting specialist for the new region, representing both the Emerson Electric Prylites and Emerson Electric Imperialites.

Salesmen assigned to the new region are Jack Drake, Charles Strauss, Dennis Cassidy, Gordon Laursen and Gerald Andrews. The new sales region, formerly a part of the over-all Southern region, includes all of New Mexico, Texas, Oklahoma, Arkansas, the northern part of Mississippi, western Tennessee and western Louisiana.

• • •

THREE NEW SALES representatives joined the Progress Manufacturing Co., Inc., last month, while a fourth moved across the country. Jack Akin represents Progress in Kansas, Nebraska and parts of Iowa and Missouri, with headquarters in Kansas City. Frank Cody represents Progress in Georgia, Alabama, Eastern Tennessee and Pensacola, Florida. Mr. Cody will make his headquarters in Atlanta. Leonard Schwartz, who is now an associate salesman in Texas, will work out of San Antonio.

Sam Humphrey, who for the past four years represented Progress, in Kansas and Nebraska, is taking over the territory of Oklahoma and East Texas, headquartering in Dallas.

Men moving up in the industry

HENRY G. WALESCH has been appointed field sales manager for Ramset Fastening System, New Haven, part of Olin Mathieson Chemical Corp. He was formerly district sales manager for the Ohio-Pennsylvania-New York State area.

• • •

APPOINTMENT of Martin J. Tuckett as general sales manager has been announced by the Greenlee Tool Co., Rockford, Illinois. Tuckett has been directing merchandising and sales promotion activities in the company's hardware and industrial fields.

Delbert Wilson was named assistant sales manager in the same move. Wilson has been with Greenlee Tool Co. for six years in various capacities.

* * *

JAMES L. RICHARDSON has been appointed advertising and sales promotion manager of General Electric's Distribution Transformer Department, Pittsfield, Mass., James L. Elrod, department marketing manager has announced.

Richardson's appointment is effective immediately. He joined Gen-

James L. Richardson

eral Electric Company in 1950 as a news editor in the Company's Meter and Instrument Department, Somersworth, N. H.

Prior to his present appointment, he served as the Meter Department's advertising and sales promotion manager.

* * *

KENNETH D. CUMMINGS has recently been appointed assistant sales manager for the Moe Light Division of Thomas Industries Inc., Louisville, Kentucky, according to E. Allen Lea, sales manager.

Cummings has been associated in sales with Thomas Industries since 1950. More recently he served as district manager in the Seattle, Wash., territory.

In his new position, Cummings will work closely with sales man-

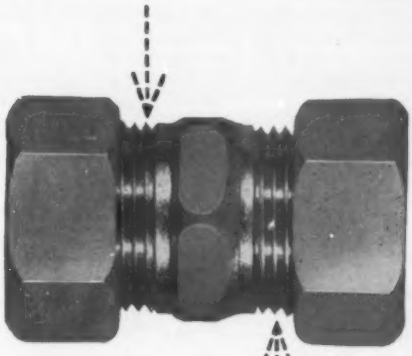
K. D. Cummings

"LOOK...THE TOP OF THE POLE IS FOR THE BIRDS! DON'T TAKE ANOTHER STEP TIL YOU SEE HOW WE'RE REGULATIN' THIS BUSINESS OF POLE CLIMBING!"

LOOK FOR BIG NEWS COMING FROM THE ORIGINATORS OF ⅝% STEP REGULATORS

A-1193

ALLIS-CHALMERS



Full perfect threads

work faster and easier

BLACKHAWK EMT FITTINGS have full, true, perfect threads for ease and speed of installation. Bodies of heavy steel — cadmium and zinc finished to eliminate corrosion on the unit itself. Blackhawk's new EMT fittings are rain tight. Quality controlled at every phase of the manufacturing. In demand for electrical jobs large and small because they're easy to use.

Blackhawk's new EMT fittings are a product of continuing Blackhawk research and automated methods of manufacture. Order a stock today to meet the demand for these quality made, EMT fittings. A complete range of sizes is now available.

Blackhawk Industries

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agement in the development and execution of sales policies and programs on the national level.

* * *

SEVERAL promotions, including two district managers, have been announced by Duke Power Co. The company serves the Piedmont section of the two Carolinas.

A. M. Doolittle was appointed district manager at Anderson, S. C. to succeed W. G. Wiatt. Wiatt became district manager at Spartanburg, S. C., succeeding John V. Brookshire, who has retired but remained with the company in a consulting capacity.

Doolittle was assistant to the manager of the Charlotte, N. C. district and was a former Mooresville, N. C. district manager. He is a native of Athens, Ga. and a graduate of Clemson College.

Wiatt, manager in Anderson since 1954, is a native of Auburn, Ala., and a graduate of Alabama Polytechnical Institute at Auburn. He holds membership in Eta Kappa Nu, honorary engineering fraternity.

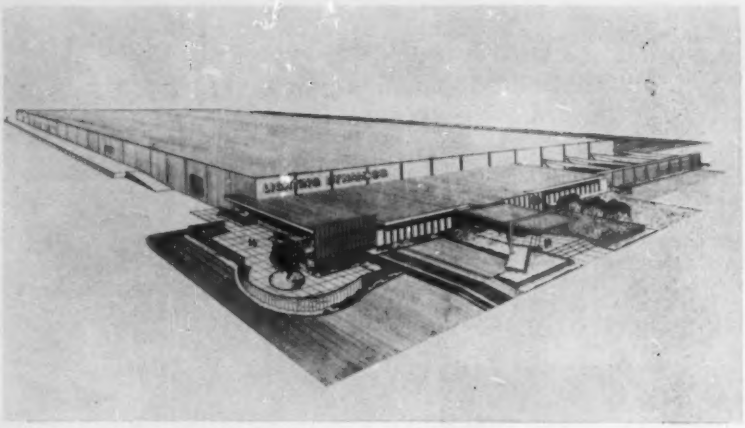
These promotions were announced by D. W. Jones, of Charlotte, vice-president and supervisor of branches.

* * *

APPOINTMENT of J. M. Duncan as manager, Industries Group Sales, Washington office, and of B. G. Camp as manager of the Atlanta district has been announced by Allis-Chalmers.

Duncan had been manager of Allis-Chalmers Atlanta district since 1956. Camp had been a sales representative in Allis-Chalmers Charlotte district since 1946.

Both are graduate electrical engineers, the former of Duke University and the latter of North Carolina State.



This new 100,000 sq. ft. factory is being built for Lighting Dynamics.

Brief news notes of manufacturers

THE FORMER Peerless Electric Company of Warren, Ohio has become Peerless Electric Division—the fourteenth division of H. K. Porter Company, Inc., diversified Pittsburgh-based industrial concern, it has been announced by C. L. Holbert, Porter president. Ralph Kroehle, Peerless chairman of the board, will continue with Porter as a consultant. S. C. Powers, who has been president of Peerless, will continue as the Division general manager. Through the years Peerless has manufactured electric lamps, electronic devices and controls, fans, blowers and motors.

* * *

LIGHTING DYNAMICS, INC., of Los Angeles, California, a subsidiary of the John C. Virden Co., of Cleveland, manufacturers of fluorescent lighting equipment, officially broke ground for its new plant in the City of Industry, near Los Angeles, Calif. The two million dollar project will cover 100,000 sq. ft.

Designed specifically for the manufacture of lighting fixtures, the new building will act as its own "merchandiser." Each office will have a different type of ceiling and a different type of lighting fixture. Access holes in the ceiling will allow inspection of mounting arrangements for each model. An overall constant level of illumination will be maintained by a photoelectric scanner control, and motorized dimmer circuits.

Control of solar heat and light will be achieved by a system of louvers outside the building. Activated by photo-electric cells, the louvers will open and close automatically according to the amount of protection required.

WESTINGHOUSE Electric Corporation executives joined with estate and local officials recently in groundbreaking ceremonies at the site of the company's new power transformer plant in Muncie, Ind.

The new multi-million dollar plant will manufacture large power transformers and represents the largest single capital expenditure Westinghouse has ever made for a new plant project.

* * *

HOWARD D. TINDALL has joined Delta-Star Electric Division, H. K. Porter Company, Inc., as manager of transformer sales and engineering. His headquarters are in the Division's Electric Service Works at 17th & Cambria Streets in Philadelphia. Mr. Tindall has been associated in important capacities with other transformer manufacturers.

Technical books

for the electrical man

Transformer engineering

"Transformers: For the Electric Power Industry," by Richard L. Bean and others. Published by McGraw-Hill Book Company, Inc., 327 West 41st St., New York 36, N. Y. 426 pages, 277 illustrations, $12.50.

This just-published book is a practical manual on electric power transformers—comprehensively and authoritatively giving ground work in transformer design, construction, application, operation, and maintenance.

Besides empirical equations, tables, and other up-to-date reference data, the book includes new material on the economics of transformer design and application. It also covers recent advances in methods of temperature calculation; testing techniques; estimation of eddy and stray losses; gauging the transformer's life span; insulation materials and methods; and fault detection.

A chapter on "Insulating the Windings" shows what is actually going on within the insulation during transformer service. It coordinates the problem of voltages which appear in various parts of the winding with the types of structures which are used, their strengths, and characteristics of the materials. The section on maintenance, detection of faults, and protection is based on recent researches reported to the AIEE.

Extensive bibliographies and appendices, plus 277 photographs and drawings, are used to clarify both basic fundamentals and such prac-

tical matters as impulse testing, connections, oil deterioration, lightning protection, corona detection, magnetic principles, heat dissipation, and others. The book interprets much of the ASA Test Code governing transformers into less technical language.

The authors are all members of the Transformer Engineering Department, Westinghouse Electric Corp.

Transistors

"Understanding Transistors," by Milton S. Kiver. Published by Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill., 64 pages, illustrated, 50¢.

This new handbook not only serves as an excellent introduction to transistors, but also as a helpful reference for those already acquainted with the subject.

Beginning with a concise discussion of the properties of germanium, the opening sections of the book clarify important basic theory and provide a solid foundation for the succeeding chapters. Subjects covered include: Atoms and Molecules; The Germanium Atom; Electrons and Holes; Current Flow; Junction Transistors; Drift Transistors; Tetrode Transistors; Alloy-Junction Transistors; Surface Barrier Transistors; Basic Transistor Amplifier Circuits; Power Amplifiers; RF and IF Amplifiers; Transistor Oscillators; Silicon Transistors; etc. Many additional transistorized circuits, with a detailed explanation of each, are also included. There are over 50 diagrams and illustrations.

Electrical engineering

"Electrical Engineering for Professional Engineers' Examinations," by John D. Constance, engineering registration consultant. Published by McGraw-Hill Book Company, Inc., 327 West 41st St., New York 36, N. Y. 456 pages, 381 illustrations, $9.50.

This newly published volume offers candidates for professional engineer's license the materials they need to prepare for the electrical engineering examination. The book provides a quick run-through of electrical theory and methods of application, and scores of questions which are typical of those asked at the examination.

Each question in this volume is followed immediately by the type of answer expected by the boards of examiners in the various states. Several appendices provide a number of additional questions with answers that exemplify theory or stress a particular subject. The organization of material and its indexing permit the engineer to concentrate his attention in those areas where he feels the greatest need.

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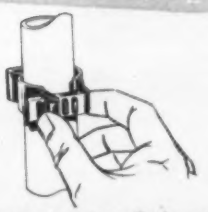

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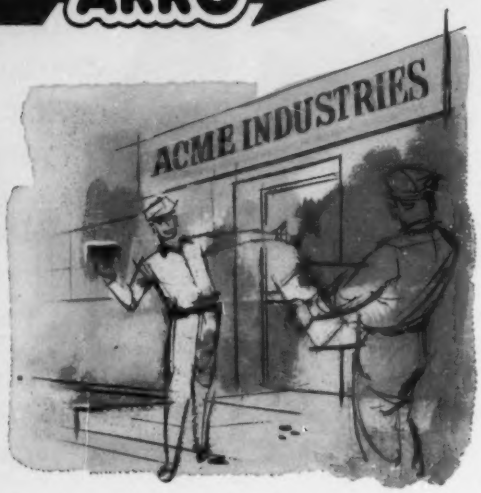

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Helpful literature

Catalog GC-106 describing its full line of baseboard, wall panel and ceiling-recessed glass **electric radiant heaters** is available from the **Berko Electric Mfg. Corp.**, 212-40 Jamaica Ave., Queens Village 28, N. Y. The catalog features technical and descriptive information on the uses and operation of Berko's unique electric heaters for home, business and commercial applications, as well as specifications on baseboard heating systems, wall panels, and ceiling-recessed heaters.

Write B-1216 on reply card, Pg. 11

Complete engineering data for Plugmold 2000, **multi-outlet system** manufactured by The **Wiremold Co.**, Hartford, Conn., is contained in a six-page, illustrated folder available without charge from the company. The folder contains detailed information on wire capacity, methods of fastening to various surface types, devices and fittings, and installation instructions.

Write B-1217 on reply card, Pg. 11

Illustrated information on **a-c solenoid type contactors** has been published recently in Bulletin 4455, by the **Ward Leonard Electric Co.**, Mount Vernon, N. Y. Information on main contacts, operating coils, connectors, auxiliary contacts, and mechanical interlocks is included.

Write B-1218 on reply card, Pg. 11

An illustrated brochure giving specifications and recommendations for use of N.E.M.A. standard **asbestos insulated wire and cables** is now available from **Western Insulated Wire Co.**, 2425 East 30th Street, Los Angeles 58, Calif. The brochure features the Bronco Western line of insulated wire, and covers A.V.A. power cable, A.V.A. lighting cable, A.V.B. switchboard wire, A.I.A. power cable, A.F. fixture wire, A.I. range wire, and A.I. range cable.

Write B-1219 on reply card, Pg. 11

The new **XL BUStribution Duct**, a new system combining safety and ease of installation, is described in the new illustrated booklet put out by the **Bulldog Electric Products Div., I-T-E Circuit Breaker Co.**, Box 177, Detroit 32, Mich. The system features low voltage drop, 50,000 ampere RMS short-circuit rating in all sizes above 225 amps, and single-bolt connection in all sizes up to 800 amps.

Write B-1220 on reply card, Pg. 11

Bulletin 1320, a twelve-page catalog covering the complete line of **economy renewable fuses** manufactured by the Economy Fuse Division of **Federal Pacific Electric Co.**, 50

Paris St., Newark 1, N. J., has been issued by the company.

Write B-1221 on reply card, Pg. 11

A newly-revised, fully illustrated Catalog EN-S2 offers complete information about the full line of **thermocouples and thermocouple components of Leeds & Northrup Co.,** 4934 Stenton Ave., Philadelphia 44, Pa., and is available on request. Recommendations are given on the choice and use of thermocouples and assemblies and on the limitations of protecting tube and well materials.

Write B-1222 on reply card, Pg. 11

A four page folder titled **"Two-Way VHF-FM Mobile Radio System"** describes the new Aerotron Model 6N15, an extremely compact unit featuring new circuits and a 6, 12 and 115 volt power supply. The folder may be obtained by writing to **Aeronautical Electronics, Inc.,** P. O. Box 6527, Raleigh, N. C.

Write B-1223 on reply card, Pg. 11

An eight-page bulletin, GEA-6860 contains a definition, tells when and where to use, and how to select **reduced-voltage motor-starting equipment** made by **General Electric Co.,** Schenectady 5, N. Y. Illustrated bulletin contains starter selection table, and a comparison table for determining which starter best suits the desired reduced-voltage application.

Write B-1224 on reply card, Pg. 11

Materials for **underfloor electrical distribution systems**—such as duct, junction boxes and fittings—are illustrated and described in 20 page, 2-color Walker Catalog No. 35. Product changes include die-cast 2-inch pipe-threaded inserts in Walkerduct. Write to **Walker Brothers,** Conshohocken, Pa.

Write B-1225 on reply card, Pg. 11

Special emphasis has been placed on **electronic equipment for industry** in the new 1960 catalog just released by **Allied Radio Corp.,** 100 N. Western Ave., Chicago 80, Ill. Allied's new 528-page catalog, which includes 232 pages in rotogravure and 4-color covers, lists over 40,000 items, including extensive listings of parts and equipment for industrial maintenance, research and production requirements.

Write B-1226 on reply card, Pg. 11

Designed primarily for electrical construction and plant maintenance electricians, the vest-pocket sized 36-page book "pres-SURE-TIPS" gives about 25 helpful and time-saving applications of Buchanan pres-SURE-connectors for **solderless wire splicing** and terminating. Published by **Buchanan Electrical Products Corp.,** Hillside, N. J., and illustrated with over 70 drawings, this 36-page carefully edited practical book gives easy-to-follow examples of many jobs

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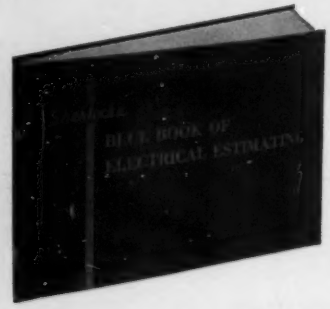

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(December 1959)

that can be done with just one Buchanan hand crimping tool.

Write B-1227 on reply card, Pg. 11

A colorful four page catalog from **Dayna Lighting, Inc.,** New Britain, Pa., a subsidiary of the **Progress Manufacturing Co., Inc.,** Castor Ave. and Tulip St., Philadelphia 34, Pa., describes the new Dayna Meridian Collection. This is a group of **Oriental pendants** that combine Eastern mystery with simple modern lines. Detailed drawings illustrate the smallest detail of the pendants and hangers—and vivid colors reproduce the actual exotic excitement of the fixtures.

Write B-1228 on reply card, Pg. 11

New 16-page catalog presents the Miami-Carey line of **kitchen, bath and laundry ventilating equipment,** manufactured by the **Miami Cabinet Division of The Philip Carey Mfg. Co.,** 320 S. Wayne Ave., Lockland, Cincinnati 15, Ohio. Ventilating fans for the kitchen, bath and laundry, available with baked-on white enamel and chrome-plated grilles, are illustrated along with specifications and installation drawings.

Write B-1229 on reply card, Pg. 11

Now, 12 complete pages packed with descriptive data covering types and usage of **electrical and lubricating devices,** made by **Trico Fuse Manufacturing Co.,** 2948 N. 5th Street, Milwaukee 12, Wis. Many newly developed products are included to assist industry in cutting costs of maintenance and increasing production. For easy reference, all items are listed complete with catalog numbers, capacities and sizes.

Write B-1230 on reply card, Pg. 11

Channel type lighting supports for installing wiring and electrical lighting fixtures in plants, industrial and commercial buildings are discussed in a new illustrated, eight-page Bulletin G-2, just published by manufacturer **Steel City Electric Co.,** 1207 Columbus Ave., Pittsburgh, Pa. The new brochure is designed for use by electrical engineers, electrical contractors, architects, plant maintenance superintendents and others who specify electrical equipment.

Write B-1231 on reply card, Pg. 11

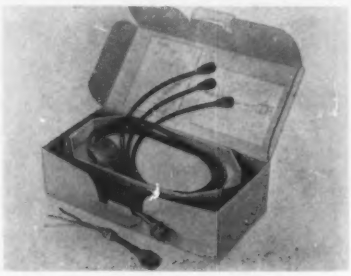
A new 162-page digest "Allis-Chalmers Motor Control," with descriptive, pricing, technical and engineering information on its complete line of **motor controls** has been prepared by **Allis-Chalmers Manufacturing Co.,** Milwaukee 1, Wis. A quick reference selector guide at the front of the digest makes it easy to find any starter, controller or pilot device in the book. This condensed version of Allis-Chalmers electrical control price book is cross referenced with the price book numbers at the bottom of each page.

Write B-1232 on reply card, Pg. 11

New products

Portable power distribution operates on 3-pole system

A METHOD of eliminating makeshift harnesses used to bring temporary power to tools and lighting in home construction and other similar situations, is being introduced by the Tuffline Division of Whitney Blake Co., New Haven 14, Conn. This



new method consists of a 3-pole system of Whitney Blake Dynaprene SO cords permanently molded to heavy-duty neoprene connectors.

The manufacturer claims that the system, including the patented connectors, is completely waterproof. It is also stated that the specially designed connectors prevent unauthorized use and power theft. The system consists of a 15-inch section for easy connection to the power source.

Write P-1233 on reply card, Pg. 11

New hydraulic bender quickly makes offsets

A MULTIPURPOSE hydraulic pipe and conduit bender of completely new design has been developed by Greenlee Tool Co., Rockford, Ill., to make accurate offsets and full 90° bends close to the end of ½" to 2" pipe or conduit with but one setting and one ram stroke. Offsets are always in perfect alignment, no dog-legs. In addition, 180° bends, or bends of any degree between 90° and 180° are easily made.

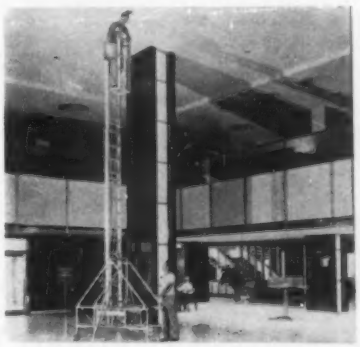
This versatile new Greenlee bender is easily, quickly set up and operated by one man. Any worker with simple instructions, using the furnished bending charts can make perfectly aligned, clean offsets and bends up to 180°.

The unit develops 15 tons of ram pressure and can be hand or power pump operated. It is easily wheeled from job to job.

Write P-1234 on reply card, Pg. 11

Relamping time reduced 50% with telescoping platform

Up-Right Scaffolds, 1013 Pardee, Berkeley, Calif., has available a telescoping work platform known as the Tallescope. The structure is assembled by one man and is extendable for reaching heights up to 31 feet. The



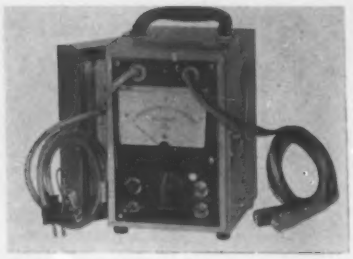
aluminum platform is on wheels and will move with the job and fold down to roll through doorways. The telescoping platform eliminates time required in scaffold assembly, tearing down, and re-assembly.

Write P-1235 on reply card, Pg. 11

Insulation tester provides audible breakdown signal

PORTABLE INSULATION breakdown testers featuring an automatic "Squawker" that sounds at preset leakage current values, are now added to the Hypot-R Jr. line of dielectric strength testers manufactured by Associated Research, Inc., of 3777 W. Belmont Avenue, Chicago 18, Ill.

When preset leakage current limits have been reached, this "Squawker" provides an audible signal, thus enabling production and maintenance testers of electrical equipment to work at a substantial distance from the test set.



The operator need not take his attention off the point of test to watch for visual breakdown indication while moving test prods about the terminals of a multi-conductor cable, or when checking a large group of motors arranged on a warehouse floor. This not only makes testing more accurate and rapid, but also contributes to the safety of the operator.

Write P-1236 on reply card, Pg. 11

Rigid plastic conduit now listed by U-L

KRALOY Plastic Pipe Co. of Los Angeles, Calif. has announced the listing of Kraloy PVC (polyvinyl chloride) rigid electrical conduit by Underwriters Laboratories. This is the first plastic electrical conduit to receive this coveted recognition.

This will be of special interest to architects, engineers, electrical contractors and electrical wholesalers in commercial, industrial and utility fields.

Kraloy PVC rigid electrical conduit, now U-L listed, is available in all standard conduit sizes including fittings.

Write P-1237 on reply card, Pg. 11

Short stroke, light weight make faster pipe pusher

MERCURY HYDRAULICS, 1632-46 Wazee St., Denver, Col., has announced major design changes in their fully powered "Speed-Thru" pipe pushers.

Early in 1956, Mercury introduced the original "Speed-Thru" models with a 21-inch continuous stroke. Major changes on all 1960 models incorporate a new higher speed, 12-inch stroke design, pushing one foot in 11 seconds.

The new pushers, which come in

three sizes capable of gripping up to 4" I.D. pipe, and with thrusts up to 110,000 lbs., are now in production, in time for the winter season and frozen ground installations. The shorter stroke, according to company engineers, serves to increase speed, provide easier handling due to the shorter length and lighter weight, and creates extremely greater strength in the structural design.

Write P-1238 on reply card, Pg. 11

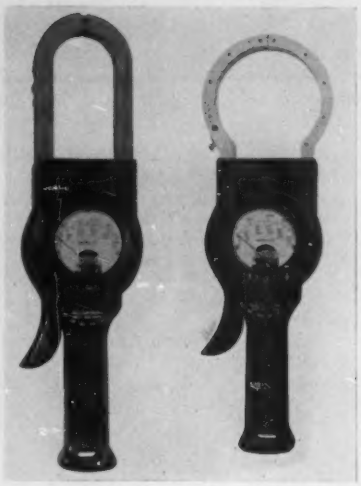
Expanding clamp-type jaws give more uses to ammeters

EXPANDING clamp-type jaws, plus a wider range of measuring, allow a new kind of ammeter to measure up to 4,000 ampers of conductor current at one time. The device, made by Western Electro-Mechanical Co., Inc., 300 Broadway, Oakland 7, Calif., is being produced in four different sizes, depending on the conductors to be measured.

The clamp-type jaws represent a new thought trend in ammeters, and allow the rapid measurement of a-c current without breaking the circuit. Current values most frequently encountered in industrial and service work are completely covered by the three or six range sizes.

The models are made to fit conductors that include the following sizes: 3½", 4½", and 2¼ x 4". Accurate within 3 % the ammeters are the result of improvements made on the Weston Model 633, made by this same company. Non-shatterable glass, selection of current ranges at the flick of a switch, and fast, well damped movement are other attributes of the new models.

Write P-1239 on reply card, Pg. 11



Pocket-size VOM kit serves as handy low-cost test unit

ALLIED RADIO CORPORATION, 100 N. West Ave., Chicago 80, Ill., announces the release of a low-cost, pocket-size VOM kit. Hardly larger than a package of cigarettes, the new Knight-Kit Pocket VOM Kit reads in 13 ranges at 1000 ohms-per volt d-c sensitivity. The ranges are d-c volts, 0-5-15-50-150-500; a-c volts, 0-15-50-150-500; d-c milliamps, 0-1-10-100; ohms, 0-30,000 (1200 ohms mid-scale).

The small size of the VOM makes it a handy carry-about test unit for

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servicemen, electrical inspectors, and hobbyists — can be conveniently placed in pocket, tool-kit, or glove compartment. It has a front-panel zero-adjust, 2½" meter with two-color scale, and 5% shunts and multipliers.

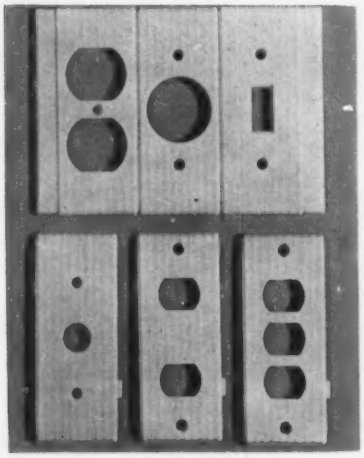
Only 2⅜ x 3¾ x 1½" when as-assembled, the kit is supplied complete with battery and test leads. The Knight-Kit Pocket VOM Kit is listed under Stock No. 83 Y 708 and priced at $9.95.

Write P-1240 on reply card, Pg. 11

Sectional wall plates make switch arranging easy

SECTIONAL WALL plates, newly introduced by Pass and Seymour, Inc., Solvay Stat., Syracuse 9, N. Y., make it simple to arrange any desired combination of switches, outlets or Despard wiring devices.

They are made of plastic in brown or ivory and are self-aligning with a



lug and slot arrangement which locks the sections securely.

The plates line up perfectly in any number of combinations and permit a complete, matching Uniline installation.

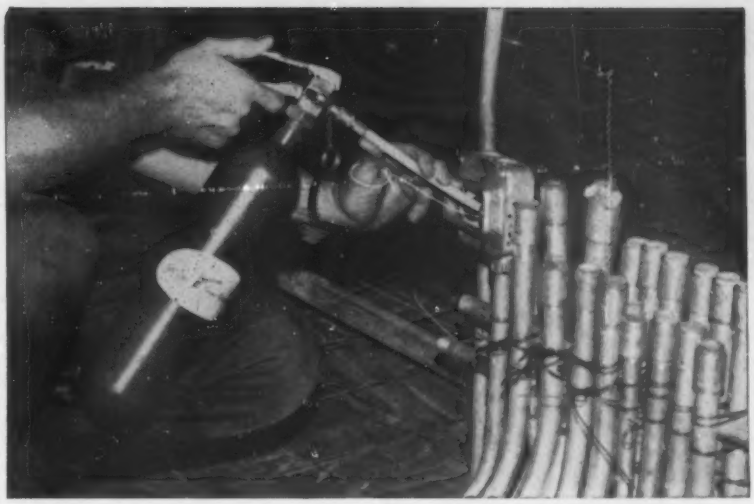
Designed to save time and money, the end sections and the center sections come in nine styles for use with switches, outlets, Despard devices, telephone jacks, or a blank.

Write P-1241 on reply card, Pg. 11

Metal pipe pole base has own junction chamber

HOPE ELECTRICAL Products Co., of 39 Long Avenue, Hillside, N. J., has announced the production of a new model of the Hope metal pipe pole base, a malleable iron support of outdoor lighting uprights with its own junction chamber accessible through the front cover.

The new model features an optional



NEW

*Pat. Pending on Entire Method and Apparatus

Jet Line Cylinder

eliminates snaking in ½" and ¾" conduit!

The new Jet Line Cylinder makes short work of wiring ½" and ¾" conduit . . . saves up to 70% of wire-pulling costs . . . can pay for itself on one or two jobs!

Now you can lay a line through one . . . ten . . . even fifty conduits in minutes, regardless of lengths, bends, or loose obstructions! Place a line package in the conduit; secure the free end of the line. Butt the Cylinder seal-off assembly to the end of the conduit and activate the valve . . . pressure, from the expansion of a harmless gas, travels the lightweight line package through the conduit in a split second! The strong nylon line, laid by the package, is used to draw polyethylene rope, then wire, through the conduit in minutes!

The Jet Line Cylinder is safe, no inflammable substances or explosives are used, and nylon line and polyethylene rope are non-conductors.

Kit contains: Cylinder, valve, pressure regulator, valve operating mechanism, and full pressure attachment with variable head. Cylinder refillable; spare cylinders available. Order a Jet Line Cylinder Kit now . . . forget fish tape forever!

OWN THE COMPLETE JET LINE SYSTEM *

Jet Line Cylinder for ½" and ¾" Conduit • Jet Line Gun for Conduit 1" or larger

Be prepared for all conduit wiring jobs, carry the *complete* Jet Line System . . . Cylinder and Gun. SAFE, QUICK, SURE, the Jet Line System, invented by experienced electricians, has been thoroughly job tested. Compare its speed and simplicity with long hours spent in snaking . . . count the time you save in dollars!

For complete information and prices, write your distributor or

Jet Line Gun Company

615 FUGATE AVENUE, CHARLOTTE 5, N. C.

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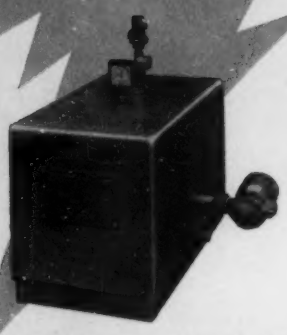
ELECTRIC HOT WATER HEAT TO 2,000,000 B.T.U.



PRECISION

ELECTRIC HOT WATER HEATING BOILER

COMPLETE UNIT READY FOR INSTALLATION with circulating hot water system and water chiller for year-round air-conditioning

CONVERSION EASILY ACCOMPLISHED where other type fuels now used. Suited for homes, churches, motels, apartments, hotels, hospitals, commercial buildings, swimming pools, snow melting and domestic hot water. Temperature Range 60 to 250 degrees.

Every unit tested and inspected.

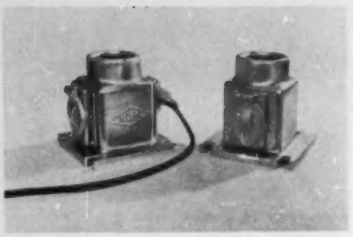
- 40,948 B.T.U. to 2,000,000 B.T.U. Output.
- All Boilers meet the requirements of the ASME Boiler and Pressure Vessel Code.

No flame!
No ducts!
No noise!
No chimney!
No odors!

Write for specifications and prices.

PRECISION parts corporation

400-ES NORTH FIRST STREET
NASHVILLE 7, TENNESSEE



208-volt weatherproof three-pole receptacle cover, in addition to the previously available optional 110-volt three-pole cover.

This model was developed as a result of the increasing installation of 110/208-volt lines in many current industrial and non-industrial construction projects. The higher voltage line is proving to be less expensive for the operation of tools than the cost from 110-volt power sources. Emergency generator for units for lighting and high-speed power tools also demand a greater supply of high-voltage auxiliary power in out-of-doors maintenance operation.

Write P-1242 on reply card, Pg. 11

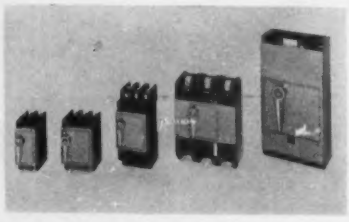
Circuit breakers now safer, simpler with rotary handles

A NEW LINE of molded case circuit breakers featuring integral rotary handles, which offer maximum safety, ease of installation, and reliability of operation, has been introduced by Federal Pacific Electric Co., 50 Paris St., Newark 1, N. J.

The breakers in the new line include 15 to 100 amp 480 volt EF frame breakers, 15 to 225 amp 600 volt F frame breakers, 70 to 400 amp 600 volt J frame breakers, and 125 to 800 amp 600 volt M frame breakers. These units can be used in commercial and industrial applications in switchboards, control centers, panelboards, control panels, and individual enclosures.

Since the rotary operating handle is an integral part of the breaker, external linkage is eliminated, thus handle misalignment and false indication of breaker contact position is impossible. The handle position is clearly visible from a distance, and the mechanism has been designed to clearly indicate a center trip position.

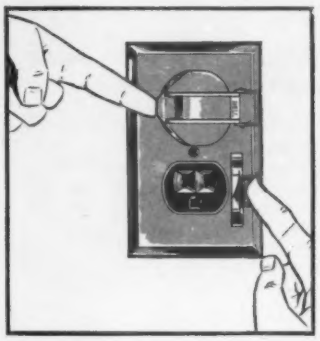
Write P-1243 on reply card, Pg. 11



Span-cover weatherproof unit added to Bell line of outlets

BELL ELECTRIC CO., 5735 S. Claremont Ave., Chicago 36, Ill., manufacturer of the famous "No-Shok" safety electrical outlets, has announced a new construction in their Saf-T-Lok snap-cover weatherproof outlet covers.

The new Bell Electric Saf-T-Lok Snap-Cover utilizes a unique phos-



phor-bronze spring that holds the weather-tight receptacle cover open, yet snaps shut with an easy, straight-down fingertip pressure.

The Snap-Cover spring, a Bell exclusive, permits easy one-hand in-

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Universal
THIEL'S
HUMP
"NAIL-IT"
For fasteners that hold. This THIEL hump drive NAIL - IT strap has a sturdy head to insure an easy drive without bending . . . will not pull out. Zinc-plating prevents rust . . . made of #8 heavy wire. Available in copper plating for plumbers use.
Sold by Leading Electrical Wholesalers
THIEL
TOOL AND ENGINEERING CO.
1417 NORTH MARKET ST.
ST. LOUIS 6, MISSOURI
Send for
FREE Samples

sertion of plug. Cover locks in the open position, never rests on appliance plug or cord, is instantly snapped shut when not in use. The Covers are designed to accommodate single or duplex receptacles, duplex switches or switch and receptacle combinations in either parallel slot or 3-wire grounding types.

Write P-1244 on reply card, Pg. 11

Unit combines fluorescent and incandescent lighting

A NEW TYPE, UL listed, fixture that combines indirect fluorescent and controlled incandescant lighting into a single unit, specially designed for institutional lighting has been introduced by Prescolite Manufacturing Corp., 2229 Fourth St., Berkeley, Calif.

The new Prescolite unit has particular application for over-bed lighting in hospitals, hotels, and motels. The unit has been designed for end-to-end installation in series of two, three, or more to provide continuous unbroken light in areas which have a multiple bed grouping.

The fixture combines the best features of both indirect fluorescent and direct incandescent lighting in a single functional unit. Both light sources are controlled separately, making it possible for either or both of the lighting methods to function at any one time. Up lighting is furnished by a fluorescent tube and controlled down lighting by incandescent globes.

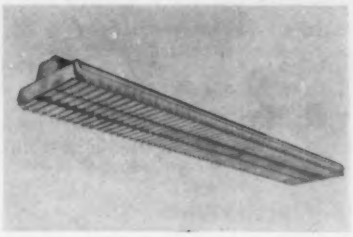
The individual units are 4 feet in length and are easily suspended from any type wall construction.

Write P-1245 on reply card, Pg. 11

Lighting fixtures utilize powerful lamps for economy

THE DEVELOPMENT of a new commercial fixture utilizing the latest Power-Groove lamps for high light output has been announced by Smithcraft Lighting, Chelsea 50, Mass.

The new Director fixture is a modern unit with a 19-inch wide "area of light" that assures superior high-level lighting in any application. The two-lamp Director produces 30,000 lumens of illumination - one-third more than a conventional four-lamp unit, and equal to a standard six-lamp unit. The high illumination allows the use of fewer fixtures to produce a given amount of light, substantially reducing the cost of lighting a given area. The Director also features good diffusion characteristics and a pleasing light pattern. Rigid steel louvers provide shielding of 25 degrees crosswise, 35 degrees lengthwise.



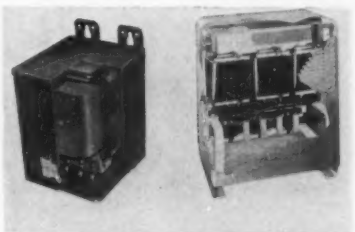
Write P-1246 on reply card, Pg. 11

High frequency transformer now available in full line

A COMPLETE LINE of 400-cycle dry-type transformers (EP, EPT, DS-3 and DT-3) from 500 kva, 600 volts and below, single and three phase, is now available from the Westinghouse Electric Corp., Box 2278, Pittsburg, Pa.

Special uses of the high-frequency transformers are for missile test facilities, air frame assembly line test facilities, ground power supplies, portable test equipment and any type of 400-cycle distribution system.

Since these transformers contain no inflammable liquids or vapors, and no toxic fumes, they can be installed indoors where concentrations of people are present. These units are suitable for outdoor service as well.



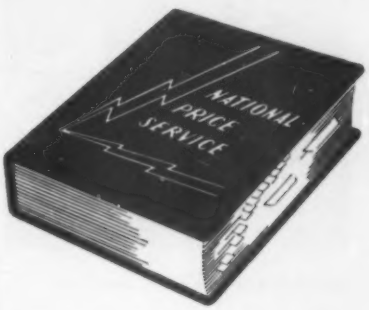
Compound-filled construction of the EP and EPT transformers allows mounting in any position since core and coils are completely supported, and ventilating air ducts are not necessary.

Write P-1247 on reply card, Pg. 11

PROFITS Guaranteed?

No... not quite... but if it were possible to guarantee profits for the Electrical Contractor and the Electrical Wholesaler... NATIONAL PRICE SERVICE would do it.

NPS can, however, provide a service that will save you time and enable you to find the right price... quickly... for a profitable estimate or sale.



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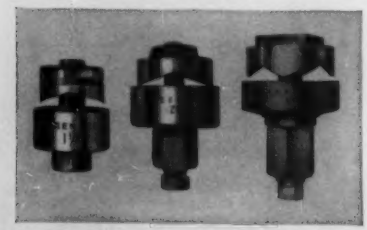
PULL CABLE FAST

through open or concealed conduit

Greenlee Cable Puller

Pull large-size cable at any angle, from any convenient location with a No. 765 Cable Puller. Use it for exposed or concealed conduit . . . high up, in close quarters, or out in the open. This powerful tool can be hand- or power-operated . . . exerts a maximum pull of 7,500 pounds and has two operating speeds . . . one for fast work, the other for a steadier, heavy pull. At all times the pull is in line with the conduit . . . no strain on the hangers. See your electrical distributor for this timesaving equipment, or write for literature.

Cut conduit holes quickly, easily with Greenlee Knockout Punches



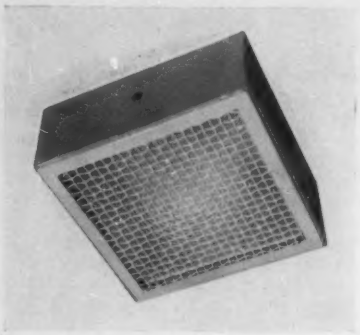
Complete range of punches to make openings for all standard conduit sizes ½" - 5". Fast, easy cutting through 10-gauge metal. Hand, ratchet, or hydraulic driver operated. Wide choice of sets.

GREENLEE TOOL CO.
1765 Columbia Ave.
Rockford, Illinois

GREENLEE

Vandal-proof light fixture is ideal for public areas

A TAMPER-PROOF, vandal-proof lighting fixture for public buildings and areas has just been introduced by the Delta Division, Light & Power Utilities Corporation, Memphis, Tenn.



The fixture, developed by James Hisserich in cooperation with the Light & Power research department, accommodates up to two 100-watt A lamps in its double 14-gauge steel housing.

Steel mesh is welded to the outer housing to protect the Corning fresnel lens against vandalism. Theft is also prevented by spanner-head screws requiring a special screw driver for access to lamps.

Write P-1248 on reply card, Pg. 11

Safety thermal cut-outs protect electric heaters

UNINFORMED homeowners may completely cover up heaters with draperies and furnishings, blocking airflow and occasionally causing excessive temperatures in the heater. To eliminate this problem, the Berko Electric Mfg. Corp., 212-40 Jamica Ave., Queens Village, N. Y., has just announced the development of unique new thermal safety cut-outs which are now built into every Electrofin heater.

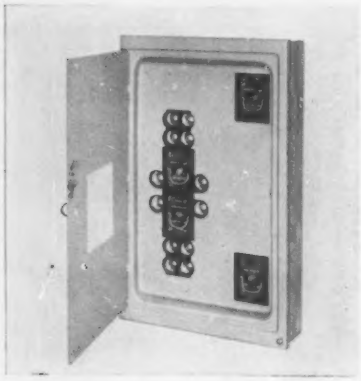
Simple, yet effective, the cut-outs are small, efficient (25 amp.) bimetal thermostats installed in the top leading edge of every Electrofin heater. They are spaced approximately 20" apart, the number used depending on the length of the heater. The Cut-Outs are wired in series with the heating elements. Thus should temperatures rise abnormally from any cause, one or more Cut-Outs will operate and disconnect the power circuit.

Write P-1249 on reply card, Pg. 11

Fuse puller panel provides 12 fuse branches, 4 pullers

A NEW 100-AMPERE parallel-connected fuse puller panel with 12 plug fuse branches and four branch pullers, one of which is sealable for use with separately metered equipment, has been announced by the Circuit Protective Devices Department, General Electric Company, Plainville, Conn.

The new unit incorporates a 60-ampere main puller for all plug fuse



lighting and appliance circuits, another 60-amp puller for the range, and two 30-amp branch pullers.

One of the 30-amp pullouts is independent of the main bussing and located in a sealable compartment. This puller can be used to control a water heater or other separately metered appliance.

Write P-1250 on reply card, Pg. 11

Versatile 53-pound drill can handle seven major jobs

A VERSATILE motor drill, the Cobra, weighing only 53 pounds, and designed for at least seven major operations, is now on the market from Atlas Conco Eastern, 610 Industrial Ave., Paramus, N. J.

The Cobra can be easily and quickly readied for any of a number of jobs, including drilling, breaking, tie tamping, splitting, post-holing, digging, tamping and cutting asphalt.

In addition to its light weight, the gasoline-powered unit features a non-return air inlet, insuring a leak proof fuel tank; a rotation mechanism incorporating a unique torsion bar which prevents engine stalling if the drill steel jams; and a filtered compressed air delivery.

Write P-1251 on reply card, Pg. 11

Snap-caps give protection to new duplex receptacle

NEW, EXCLUSIVE, dual position "Duo-Lok" caps are now featured by the Perfectline Mfg. Corp. Old Country Rd. & RR Ave., Hicksville, L. I., N. Y., on their grounding type weatherproof duplex receptacle or switch receptacle assemblies, at no extra cost. The deeply recessed "Duo-

Lok" snap-cap locks open or closed, as required. It is designed for ease of use, protection against cord damage and for a tighter, more completely weatherproof seal when the receptacle or switch is not in use. "Duo-Lok" assemblies are tamper-proof. The built-in stainless steel hinge springs will not jam, wear away or lose their snap-tension in normal use, states the manufacturer.

Write P-1252 on reply card. Pg. 11

Know the law

(Continued from page 76)

not require the machine to be taken out of service while the work is being done.

"The courts have sometimes construed the terms 'maintenance' and 'repair' as equivalents. Maintenance has been construed to include repair . . .

"If the word 'repair' has a restrictive meaning in the electrical industry, the burden was upon plaintiff to prove it.

"The Court is of the opinion that the word 'repair' was used in the contract in its common, plain and popular sense and that it is not ambiguous. An ambiguity does not arise in a contract by reason of the parties to the contract differing as to the interpretation of various provisions."

Code discussion

(Continued from page 86)

ditional fuse sizes and a few additional circuit breaker sizes have been listed as standard sizes. These include the larger fuse classifications running from 601 to 6000 amperes.

The remaining changes in Article 240 were adequately covered in our brief review of all the Code changes in the October issue of ELECTRICAL SOUTH. However, it is not amiss to direct attention again to the new fine print note in Section 240-21 which will make it mandatory for all plug fuses to be of Type S on January 1, 1961. A similar fine print note in Section 240-25(g) will make it mandatory for all 250-volt circuit breakers to be non-interchangeable between three listed classes on July 1, 1960. The three classes are from 0 to 20 amperes, from 21 to 50 amperes, and from 51 to 100 amperes.

Changes in grounding rules

In Article 250—Grounding—a new recommendation has been added to the fine print note in Section 250-5, stating, "It is also recommended that ungrounded systems supplying industrial equipment and operating at more than 150 volts and less than 600 volts be equipped with ground detectors."

An important new paragraph has been added to Portable Equipment which lists appliances that are now required to be grounded. These are listed in Section 250-45(c) as follows: "In residential occupancies, (1) clothes-washing, clothes-drying, and dish-washing machines, and (2) portable, hand held, motor operated tools and appliances of the following types: drills having a chuck capacity exceeding ¼ inch, hedge clippers, lawn mowers, wet scrubbers, sanders and saws." Any receptacle outlets installed for such equipment must be of the grounding type and be grounded.

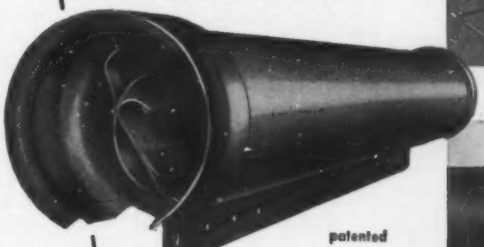
Section 250-60 has had a new sentence added which states, "The frames of wall-mounted ovens and counter-mounted cooking units shall be grounded and may be grounded in the same manner as electric ranges." This is an extension of the restricted practice of permitting the neutral conductor to be used as an equipment grounding conductor on 3-wire, 120/240 volt circuits when such neutral is not smaller than No. 10. (It is an unwelcome extension of this—I would like to say *improper*—use of a current-carrying neutral conductor in the eyes of a great many inspectors, including the writer.)

Section 250-112(a) has included insulating sections of piping, such

NEW AIR GAP LINE GUARDS

HIGH IMPACT RIGID PLASTIC

- Snaps together to cover both line and pins on 12 KV single and double arms
- Matching 34.5KV pin cover available
- 1½" air gap maintained
- Quick, fool proof installation



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Electrical test, ordering and price data in catalog 58 available on request.

BODENDIECK TOOL CO.

TAYLORVILLE, ILLINOIS

OUR COMPLETE LINE WILL SAVE YOUR TIME AND MONEY!

CEIL HEAT

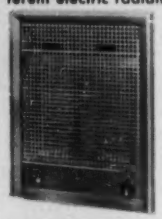
A real savings is seen when you buy all your electrical heating equipment from a single source. This, plus guaranteed quality and labor saving features assures you of more savings when you specify CEILHEAT.

The Mark of Quality in Electric Heating

RADIANT CABLES

DRI-CEIL for dry wall
ARISTOCRAT for plaster
AJAX for concrete

To meet the requirements of different types of construction, CEILHEAT manufactures 3 different electric radiant heating cables.

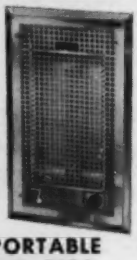


WALL UNIT HEATERS

4 sizes — 10 models — 1000 to 6000 watts — completely automatic.

BATHROOM WALL HEATERS

A 2 part unit (wall box and heating unit) — One size — 9 models — 120 and 240 Volts — 750 to 1500 Watts — Automatic or manual controls.



PORTABLE HEATERS

4 sizes (1, 2, 3 and 4 element units) — seven models — 208 and 240 Volts — 2000 to 4800 Watts — completely automatic.

BASEBOARD HEATERS

5 lengths (32" to 120") — 12 models — 120, 208 and 240 Volts — 500 to 2000 Watts — Thermostatically controlled (baseboard or wall). Additional sections: inside and outside corners, receptacle thermostat sections.

CEILHEAT manufactures the most complete line of electric heating equipment in the nation.

CEILHEAT is a registered trademark identifying only genuine CEILHEAT products.

CEILHEAT, INC.

KNOXVILLE, TENNESSEE M

as plastic pipe and insulating washers and gaskets, as well as unions, valves, meters, etc., as portions of a water piping system which must be made electrically continuous by bonding where the system grounding conductor is connected on the premises side instead of on the street side of the water meter or shut off valve.

Additional Code changes will be discussed in the next issue.

Answers to Code test questions: (1. **T** Section 230-106-a-2) (2. **T** Section 710-21-c) (3. **F** Section 230-3) (4. **F** Section 230-63-c and Table 250-94-a) (5. **F** Section 230-63-c) (6. **b** Section 230-71-a Exception No 1) (7. **c** Section 240-4) (8. **b** Section 250-5) (9. **a** Section 250-45-c) (10. **c** Section 250-112-a).

Electronic transit

(Continued from page 52)

vantage point, even though most of them were miles away and out of sight.

The portable system consists of two units, one a master unit (or "transmitter"); the other a remote unit (or "receiver"). The instrument actually records the time it takes a series of impulses to make the trip from master to remote and back. This is easily converted into miles, feet and decimals of feet.

It took the surveyors only about 30 minutes to measure a line, including mounting the instruments at both ends.

Fuel cells

(Continued from page 56)

1921, Professor E. K. Rideal discussed "The Problem of the Fuel Cell" before The Faraday Society.

A few of the more recent fuel cell investigators include O. K. Davtyan in Russia (1946), F. T. Bacon in England (1935 to the present) as well as scientists of the Pittsburgh Consolidated Coal and Coke Company, National Carbon Company and others in the United States.

Several types of fuel cells are being investigated. Among these are direct fuel cells utilizing solid fuel, semidirect cells which utilize gaseous fuel, and indirect cells utilizing an oxidation-reduction (redox) system.

Engineers see in the fuel cell a valuable energy conversion method through use of off-peak generator facilities to produce hydrogen and oxygen which can be stored, transported and utilized at will in fuel cells. Low voltage constant loads of such electrochemical processes as plating, water purification, galvanizing, electrolytic cleaning and electrolytic refining of metals could make use of this type of energy.

When the free energy of the reaction is converted directly into electric energy, as is the case in the fuel cell, there is no theoretical limitation on efficiency. The possibility of producing electric power directly from a fuel at an efficiency of 90 per cent is truly startling when compared to the best diesel engines, which are about 40 per cent efficient. Because the fuel cell does not involve heat but converts chemical energy directly into electric energy, it escapes the high heat engine energy losses.

Oil testing

(Continued from page 49)

one drop of the polar compound indicator is placed in the center of the oil spot. The indicator displaces the oil and is absorbed by the filter paper.

Absorption occurs rapidly with new oil and the resulting red spot is relatively smooth and regular in shape (See **A** in Figure 3). With oxidized oil the absorption is slow and the resulting spot is irregulator in shape (See **D** in Figure 3).

Interfacial tension is definitely related to both the indicator absorbtion time and the final shape of the spot after application of the polar compound indicator. This can be seen by referring to Figure 3, noting the final shape of the spot.

The final shape of the spots obtained by testing oil with interfacial tensions above 25 dynes/sq. cm. are about the same regular ellipse. Oils having surface tensions under 25 dynes/sq. cm. have appreciably more irregular final spots than oils of better quality. The difference between the spots is easily discernible for oils of these surface tension values (see Figure 3).

Polar indicator absorption time shows promise of being a more useful measurement than the interfacial tension of oil. The interfacial tension measurement loses substantial amounts of sensitivity as amounts of polar contaminants increase. This can be shown by observing the curves in Figure 4. Research is continuing on this method

of measuring interfacial tension to determine the remaining life of transformer oil.

The portable oil test kit contains suitable quantities of an acidity indicator, the acidity buffer and polar compound indicator (all in non-breakable measured drop plastic squeeze-bottles), filter paper, and a support to properly hold the filter paper, several eye-droppers, and printed color standards to check tests and instructions.

The simplicity of the two test procedures and the convenience of the test apparatus should combine to provide a valuable tool for operators of transformers. Laboratory examination of insulating oil can be eliminated except where the tests show it is necessary. Therefore, oil-filled transformers, regulators and related equipment can be kept on the line with less outage time.

Aerial lifts

(Continued from page 47)

ware maintenance. It is not unusual to find from ¾ to 2 million dollars in the budget for many companies for trimming. An annual reduction of only a few per cent would be appreciable. Public relations suffer if the street lights are not adequately maintained.

How lifts are being used

The accompanying photos, furnished by the manufacturers, show examples of work being done using aerial lifts.

Figure 2 shows elbow-boom lift being used for maintaining tree clearances. Most companies use a 2- or 3-man crew for this work. Pneumatic pruners and saws should be provided if maximum benefits are to be obtained. Of course, a brush chipper and chip truck complete the mechanization of this type of work.

The "industrial monkey" is shown in Figure 3. It consists of a platform mounted on an hydraulic extension boom. Foot pedals on the platform permit the tree trimmer to position himself while his hands are free at all times for his trimming tools. The objection to this device is that it does not have the flexibility in movement which is characteristic of the elbow-boom.

Figure 4 shows a 3-man crew installing a long street light bracket. The equipment is the 2-basket Skyworker of Emhart Manufacturing Co., of Milford, Conn. Other types of aerial devices would have worked as well, but without some such device installation costs would have been considerably higher.

I think the bracket attachment, replacing one of the baskets, shown in Figure 5 is interesting. You will note this bracket holds the traffic signal until it is securely clamped to the supporting messenger. Similar clamps or holding brackets can be developed for 2-man baskets on insulated platforms with a little ingenuity and have been successfully used for raising small transformers and similar equipment.

A tricky job performed recently with the fibre glass boom was the removal of a pole top between two buildings. It was removed quite safely, although there was a good deal of pole top congestion.

A case is shown in Figure 6 where the 2-man crew has found a way of making a mid-span conductor repair by using an aerial lift insulated basket. You will note this is rear-lot construction without alley access. How else could this have been done without a service interruption and lowering the conductor?

Any of us who have climbed will agree the type of outrigged construction shown in Figure 7 presents extremely hazardous working conditions. The hazard is minimized if an insulated basket, such as is shown, is available.

Any of you who still have weatherproof wire on your overhead systems will recognize the unsightly condition of festooned weatherproof braid which may become a hazard to the public. Imagine trying to remove that from the ground, or from a makeshift vertically supported ladder. With an insulated platform, work is expedited and at the same time the hazard involved to workmen and public is eliminated.

Another interesting application of aerial devices involved a 2-man crew for installing maxi-meters in connection with load testing. If you have much of this kind of work, you might find that an aerial lift platform or basket would expedite that work.

A 5-kva transformer is shown being installed in Figure 8. You will notice there are 2 men in the basket. The transformer was clamped to the side of the basket and raised. Larger transformers also have been installed in this same way.

As time goes on, I think we will

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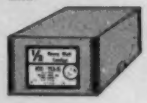

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see more and more aerial cable used both for primaries and secondaries. Figure 10 shows a lineman making a mid-span cable splice. How much safer are his working conditions than would have been the case if he had been working from a ladder or bosun's chair.

Figure 10 shows a lineman replacing a broken insulator. There are many similar types of maintenance work which might be expedited by use of such equipment.

How much easier and safer the job of replacing the broken bell on a suspension string is when an elbow-boom lift can be used, as shown in Figure 9. Admittedly the boom probably would not reach the top phase. There are many places where such equipment could not be driven. Where such aerial lift equipment can be used, I think the savings are obvious.

And for substation construction and maintenance these insulated aerial devices also have their place as shown in Figure 12.

Sales meetings

(Continued from page 34)

around Tampa and Clearwater, while the sixth get-together was a meeting of architects and engineers from these areas.

The final meeting was attended and designed to meet the needs of air conditioning and mechanical contractors from Tampa and St. Petersburg.

Said Nasworthy: "The architects learned what to specify and what was available. The electrical contractors learned it wasn't necessary for them to attempt a time-wasting wiring job with a conventional control when a more modern counterpart, instantly on order, would shorten the installation time, upgrade the job, and provide them a better profit-margin."

To the end that a better informed architect or contractor or electrician is a better-informed merchandiser, opinion of those who attended favored extension of such meetings to other areas.

As a consequence of the great need for electrical men to know more about the profit-potentialities of new devices being marketed, similar meetings are planned by Mid-Florida Electric Company, of Orlando, the Allen-Bradley distributor there.

One electrical contractor who traveled a hundred miles and gave up an evening to see the display summed up its value in the cryptic comment: "I saw more and learned more about motor controls in the 45-minute meeting than I could learn from my jobber salesman in a year!"

Contractors tell how

(Continued from page 41)

accounting methods that his money is held up while he is getting straightened out.

These types of general contractors usually get behind schedule and in turn force the sub-contractors to absorb penalities and damages. Associating with them hurts an electrical contractor in many more ways than one. The electrical contractor short of capital could well be put out of business waiting to receive payment.

The general contractor with a well-run office and efficient accounting methods knows the ropes in government work, steers clear of difficulty, and usually gets his money within a reasonable time. The electrical contractor working with him suffers no lengthy delay in collecting. Moreover, by association with him, an electrical contractor's good reputation is enhanced with local authorities.

That is why we find it worthwhile checking everyone we do business with. It keeps our accounts receivable in a healthy state.

Tool program

(Continued from page 32)

out. If the system is faithfully adhered to, then your tool control is beneficial and everyone profits. If your job foremen responsible report at once the omission of a tool from the equipment sent them, or its disappearance from the tool shed, or that it is inoperable, everyone is better protected. We take special pains to impress on our job foremen the importance of conscientious and prompt reports.

Our two full-time maintenance mechanics check, clean, lubricate and do minor repairs on all tools and equipment. All ladders and scaffolds are checked for safety, all electrical equipment must be grounded. Hydraulic equipment that leaks must be reported. Here, again, we put direct responsibility on our job foremen to see that all equipment is safe for use.

On construction jobs, we put up a tool shed for tool storage. On a small job, a tool chest is on hand

with keys held by the job foreman. A mechanic trained in the use of a special tool has access to the tool chest with his own key. In the shop, we rack motor driven tools and keep stocks and dies in bins.

On occasion we rent tools to other contractors at standard rates offering the service as an accommodation rather than in terms of a profitable business deal.

A few of our tools have been designed right in our own shop to meet special needs. We took a standard earth auger and built a boom on the front of the truck extending the shaft of the truck motor. With a V-belt pulley on it and slip clutch, the boom may be used for picking up transformers, wire reels, or for any kind of lifting. Detachable, the boom is used from the back of the truck in setting poles or pulling cable in manholes.

We use an electric mule for threading large pipe. A set of tow jacks is put to use for lifting transformers. Home-made shoes are put on the tops of the tow jacks and double for a set of reel jacks.

We never use a home-made ladder on a job. We buy only the best ladder on the market, of heavy wood, and take the precaution of having two men for any ladder over 10-feet. One man remains on the ground in readiness for any emergency.

Tools figure very importantly in time and labor savings on a job, and as I said above, can make a job either profitable or unprofitable.

Justifies low bids

(Continued from page 30)

tools used on the hospital and school jobs:

A power saw for cutting conduit. One day Brooks visited a plumbing shop and saw a Beaner pipe saw being used on soil pipe. "I didn't see why it couldn't be used on conduit," he recalls. "I tried the saw and found it cut through conduit like going through a 2 x 4. Some contractors laughed at the idea. They thought it would break me just keeping the saw in blades. But a single blade costs $3.50, and the first job on which I used my new saw, the original blade went the whole route."

Brooks says the power saw cuts all size conduit from ½-inch thin wall to 5-inch rigid. He figures the use of the saw in place of a hack saw cuts labor cost on the 5-inch conduit by as much as 75 per cent. "It sounds fantastic and even surprised me," the contractor says.

Brooks now has two of the power saws, which cost him $840 each. He says they have paid for themselves many times over.

Using one of the pipe saws, four men recently put in 1,200 feet of conduit, burying about half of it 12 feet deep and the rest five and six feet deep, in two days.

"I've timed the operation," says Brooks. "It takes one man seven minutes to cut and thread 5-inch conduit. Ordinarily this would take two men one hour."

Another tool innovation is a power wire puller. Brooks discovered the portable winch in use on a job while on a visit in the East. "I had never seen it used in my own area—and except for my one Powercrat puller that I bought for $1,000 four years ago—I haven't seen one of this type around here up to now," Brooks says.

The wire puller—which the contractor says can be used on cable up to one million circular mils—can be put in any position for pulling and is small enough to be rolled through any doorway. He estimates the puller cuts his labor force in half. The puller feeds out six feet of cable per minute.

The contractor says the wire puller "paid for itself on the first job," a new school at Hereford, Texas.

Two men can handle the wire puller, conveniently mounted on wheels for easy moving, compared to the usual tying up of four to six men with the winch truck, rope and block and tackle methods of wire pulling. General contractors who have worked frequently with Brooks' firm report the electrical contractor uses fewer men, does a job more quickly and efficiently because of his use of time-saving tools and techniques.

One of these hours-saving work techniques is an extremely workable card checkout system for controlling tools. Under the system, each item or tool has its stock number, which also is on the checkout card.

The superintendent is made responsible for tools charged out to each job. Each tool is carefully checked back in at the end of each job.

"If a man borrows a tool to take on another job, he must give the superintendent a signed receipt," says Brooks. "Although we've

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never had much trouble with actual tool loss, our checkout system is a big timesaver because it eliminates the time-consuming business of having to run down missing tools."

At one time employed by a large national grocery chain, Brooks says he learned one important thing from the grocery experience. "Those boys were whizzes at bookkeeping and merchandising," he says. "That's how they made profits, and I guess their formula was drilled into me."

Brooks' bookkeeping method is precise and up-to-the minute. "At the end of every day, we know our job costs up to that time, what materials are on the job and what materials we need to get. We have our job cost records from the very first job 16 years ago. That's how we do our estimating; we've built our forms over the years."

Brooks Electric Company, incidentally, is one of few electrical contractors in the Texas Panhandle area that employs a full-time registered electrical engineer. The engineer, C. R. "Bob" McCracken, worked out the estimating form now in use by the company.

Brooks figures that automation has cut his labor costs by an easy 25 per cent. "If it's a time-saving tool, the cost, within limits, is not an object," Brooks declares, "because the tool—if it does a job—usually will pay for itself the first time out."

Brooks has been a contractor for 16 years, has been in the electrical business for 25 years. In the 16 years of contracting, he has completed 85 school jobs alone.

He employs 19 men out of his Pampa (soon to be Amarillo) office. He also is the major owner of another shop at Perryton, in the upper Panhandle, in which his partners are Melvin Armstrong and Bob McCracken (not the engineer). The shop employs five men.

Brooks doesn't restrict his operations to major jobs. "We work everything from service calls on up," he says. "We have a very good house wiring business in Pampa and Perryton, and I expect to build such a business in Amarillo, too. If handled right, house wiring is a pretty profitable business."

Brooks maintains his own fixture warehouse, which will remain in Pampa when the move to Amarillo is made.

Obsolete tools

(Continued from page 23)

labor cost, for use and depreciation and eventual replacement. On a $20,000 job, with the labor cost at 40 per cent or $8,000, we make an allowance of 10 per cent or $800 for needed tool use, on a yearly basis, as job cost.

Allowance for tools

On a $100,000 conduit job we figure in the following:

Power saw @	**$300**
Benders @	**200**
Power vise @	**300**
Two ½-inch drills	**80**
Two ¼-inch drills	**60**
Total	**$940**

Not every job pays for its tools, nor would you use them up on a single job. Nevertheless, by figuring 10 per cent of the job's labor cost of $40,000, the 10 per cent figure of $4,000 leaves a good margin for exigencies like loss through theft or major maintenance. It is a dead certainty that tools get lost; in five years we bought 60 electric drills!

Any good businessman recognizes that it is more economical to periodically replace outworn or outmoded equipments. With costs of labor and materials zooming, it is imperative that the contractor not only cut corners where this is practical, but he also must cut costs to the bone.

Apportioning the use and delivery of expensive tools on a series of running jobs takes some foresight and planning. Otherwise we could suddenly need a score of benders or power hacksaws or electric welders on a score of jobs at one time. Every contractor knows what jobs are coming up and their nature, and it is possible to estimate with some degree of certainty just about what point in the job's progress will require a certain tool.

By judicious planning, its possible to get by with a minimum number of expensive tools on each job, or so arrange the work that as one job sees the end of a tool's usefulness the same work is coming up on another job, and the tool diverted there.

When despite such planning there still arises a temporary need

for extra tools, we rent them instead of buying.

If a 4-inch conduit job is running and using 4-inch benders, smaller benders are being used elsewhere. As each job requires the other's tools, coordinated effort often makes it possible to make a fast switch in synchronism with job needs, thus avoiding the need for either buying or renting extra tools.

The human element

A point to watch is the human tendency of the stockman on a large job, or a possessive foreman, to sort of set himself up as a small contractor. Jealously guarding the welfare of his own crew, such a man may be loath to relinquish the tools to another job. Coordination in this direction can avoid a feast-or-famine tool situation, and the stockman selected for a big job should be a competent mechanic. Such a man will very likely keep tools in good shape.

While it may at times be necessary to have duplicates of some tools for jobs that come up simultaneously, jobs should be planned so that sufficient tools are available to keep high-priced labor on the ball every hour of the working day. Only in that manner can production be increased without any increase in the working force.

Again, this means that tools must not be continued in use beyond their obsolescent period. Obsolescence is not easily measured as to time, because while a machine may still be performing satisfactorily, there may be on the market a newer model with such greater efficiency as to make its older counterpart obsolete, despite the old tool's serviceability.

Obsolescence is an occupational hazard of any business. It is part of the cost of doing business. We feel that provision for funds with which to offset obsolescence periodically through modernization is of vital importance. The fund should begin the day the new labor-saver is purchased. All too often, a preoccupied contractor fails to take this into account. By the time an expensive machine needs replacement, business may be in the doldrums and finances impoverished.

And it can happen that funds set aside are raided for periodic emergency needs so that the reserve has been depleted when a replacement can no longer be postponed economically.

Buying practices

(Continued from page 29)

set for older equipments as they decline in use and monetary value. It prevents over-all value of such assets declining. Some tool replacements may be done annually, and out of the year's net earnings in lieu of setting funds aside for later modernization. In other cases, obsolescence may be combatted by funds accumulated over several years. In either instance, the cost of new tools is spread over a considerable period and kept within manageable bounds.

Aside from other considerations, the contractor who fails to keep his labor-saving tools in such condition that they are truly time-savers, is giving the government the benefit of his obsolescence. At least this is true insofar as he is able to make a profit from his wiring business over and above his income tax personal exemptions and deductions!

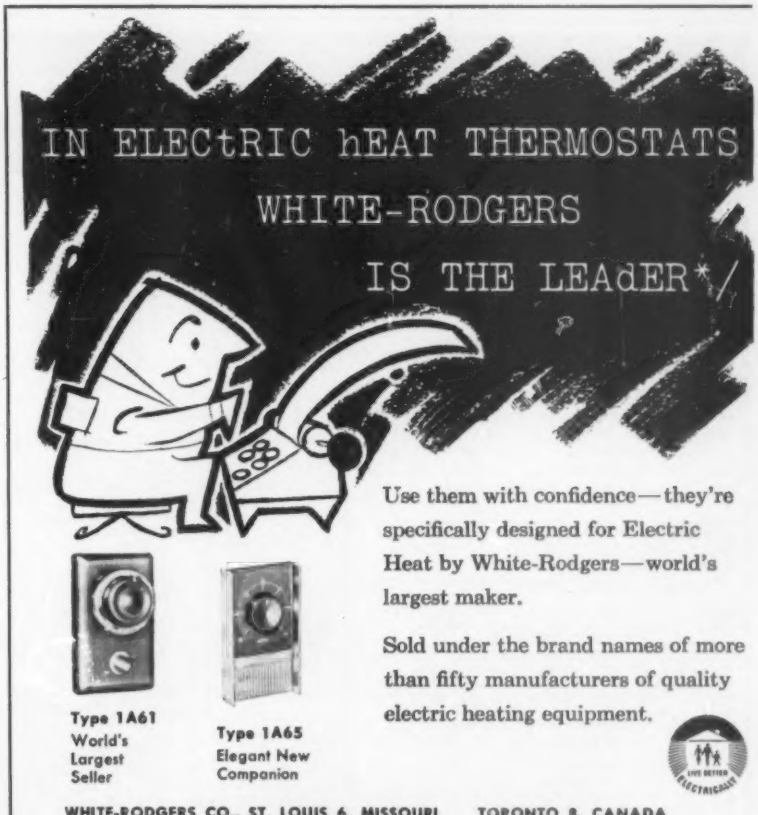
That is, to the extent that his depreciations taken on tools is decreased, or are non-existent, because of failure to replace them when necessary, to that extent are net earnings greater. As net earnings are increased by the absence of depreciation charges, to that extent a contractor penalizes himself in his tax form!

In keeping his tool and equipment up to standard and modern, even on a gradual, long-range program, the contractor may reap immediate benefits tax-wise. The annual depreciation charge traceable to needed improvements will reduce his income by the exact amount of the charge. This, in turn, will represent a tax saving.

Periodic replacement of labor-saving tools is a necessary and continuing process competitively. This is particularly true today when merchants in every line are fighting for their economic lives, with profits dripping from every pore.

Then in 1954 the company built a handsome brick office building and a 50 by 30 foot shop, the latter to house both the electrical and elevator divisions but in partitioned sections.

At the front of the plant, the electrical division occupies 5,000 square feet with excellent parking facilities and a separate shed for



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The outside pipe rack is a particularly desirable feature of the new setup. The rack has a concrete floor, steel roof, and individual bins for all sizes of conduit from ⅜-inch to 6-inch. Trucks may be loaded and unloaded from either side.

The shed will hold a car and a half of conduit. The company maintains stock valued at about $30,000, probably the most complete conduit stock in Alabama.

Another money- and labor-saving feature at the Bagby warehouse is a rack for wire remnants. In the old plant remnant wire was simply piled up at any convenient spot and eventually much of it was scrapped.

The new rack saves wire, time, and considerable money—probably more than $3,000 a year, Mr. Brakefield figures. The rack consists of numerous 1½-inch standpipes, three feet high and mounted on floor flanges. Leftover wire from No. 14 through No. 2 is neatly tied up and placed on the pipes according to size.

This system frequently saves cutting a new reel, is handy when only short lengths are required, and makes for convenient visual stock control.

Bagby's wire inventory averages about $30,000, one of the most complete in the South, Mr. Brakefield believes.

On each sidewall and across the rear of the warehouse are neatly stocked supply bins, arranged for visual stock control. Mr. Brakefield is hopeful that in the near future a card filing system can be installed for top efficiency.

Tool boxes are conveniently located on the aisles. Two full-time warehouse employees operate a check-out system on tools and supplies. A record system lists tools by job and location so that they can be moved from one job to another as needed without being sent back through the warehouse.

Special equipment frequently enables the Bagby company to handle unusual jobs. They have on hand wire-pulling machines, for example, with drums that carry as much as 500 feet of steel lead cable. The machines are powered by portable generators that can be used when local power is not available. Two or three jobs usually will pay for a machine, Mr. Brakefield reported.

The company also has steel rollers for handling wire up to two tons and so constructed that one man can operate them.

Bagby recently purchased four new service trucks, and reworked and repainted six others. Thus the company is well equipped on the transportation front.

Regarding buying practices, Mr. Brakefield pointed out the substantial savings affected by the company's policy of always buying wire by the reel, maintaining adequate stock, and thus being able to take advantage of price differences and freight rates. The same is true of conduit, which is bought by the carload.

Time-saving plans

(Continued from page 25)

a second handling would be necessary.

When the men start to work each day, materials are on the ground. On large jobs that take several months to complete, each thirty days a check is made of the takeoff sheet, to make sure that

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materials go on the job as needed.

Material buying is done in volume, with as few trips as possible to the wholesale house.

Keep pressure off men

A rule of the shop is to complete important matters first, made especially to keep pressure off the men.

"Keeping good electricians is one of the problems of the contractor," Clark emphasized. "The rules and time-saving routines we set up here are not for the purpose of putting extra burdens on the men, but to make their work easier and more efficiently performed. I feel that I have fewer labor problems than average."

Some other rules that have helped Clark to prosper fast are:

Take all cash discounts.

Employ good office personnel.

Do not work beyond the firm's financing.

He commented that most contractors, himself included, started business with capital of from $2,000 to $5,000. "All of us need extra financing, to get over the hump. My original bonding capacity was only $15,000. Now, I am happy to say, I am bonded at $400,000."

Starting business on a "shoe string," he advised, should not bar the contractor from buying good labor-saving tools. He acquired his from jot to job.

"I also value attractive, well-equipped trucks that will give the impression of prosperity and efficiency. I got my first truck by trading my car. I painted it green, with attractive lettering. Now I have a fleet of six trucks, all uniformly painted. I plan to keep my growing fleet as good-looking as possible."

Washington report

(Continued from page 18)

wages allegedly due employees under the collective bargaining agreement, that the grievance procedure outlined in that agreement does not amount to arbitration, and that, in any event, there is no authority in the agreement for a money award."

The Court disagreed with the three contentions. The Court cited decisions by other courts that allow unions to seek judgments for unpaid wages owed individual employees under union contracts.

Economic comment

(Continued from page 16)

management's job of managing, and this will be an issue that can cause real confusion. Unless management, with true statesmanlike candor, will take its problem clearly and concisely before the public, labor leaders can make a strong issue of industry's refusal to bargain.

What is really needed are a series of management messages prepared in such a way that the issues come into sharp focus for public consumption. These messages cannot be vague and general but must be pointed so that they mean something of importance to the people. Then they must be distributed as widely as possible.

Management cannot wait until 1960 negotiations begin. To be effective this policy must be adopted promptly and with real enthusiasm.

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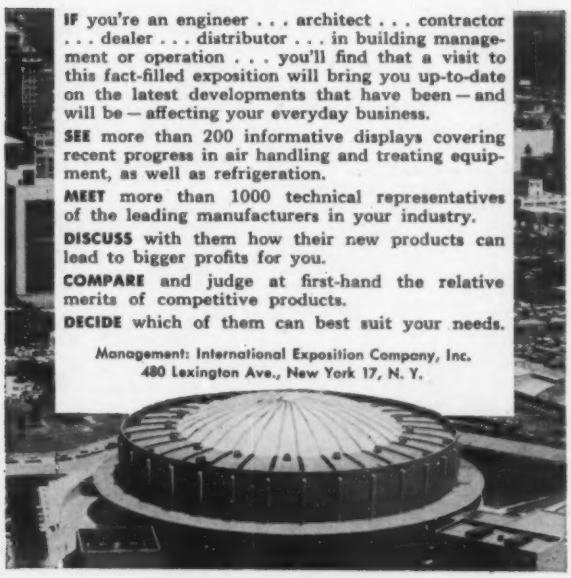

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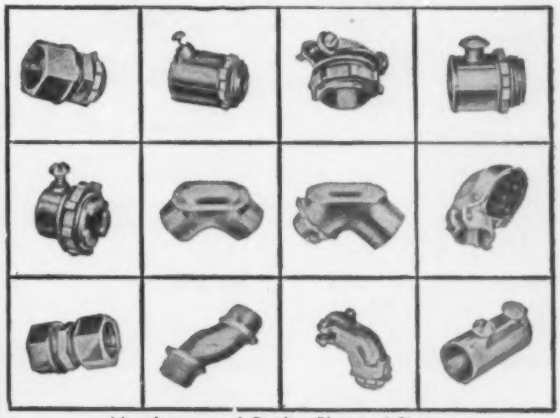

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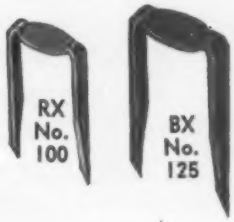

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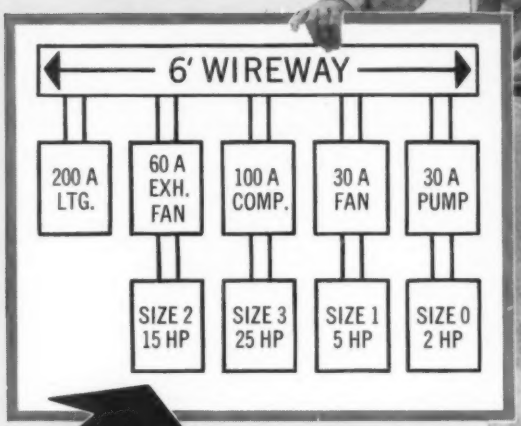
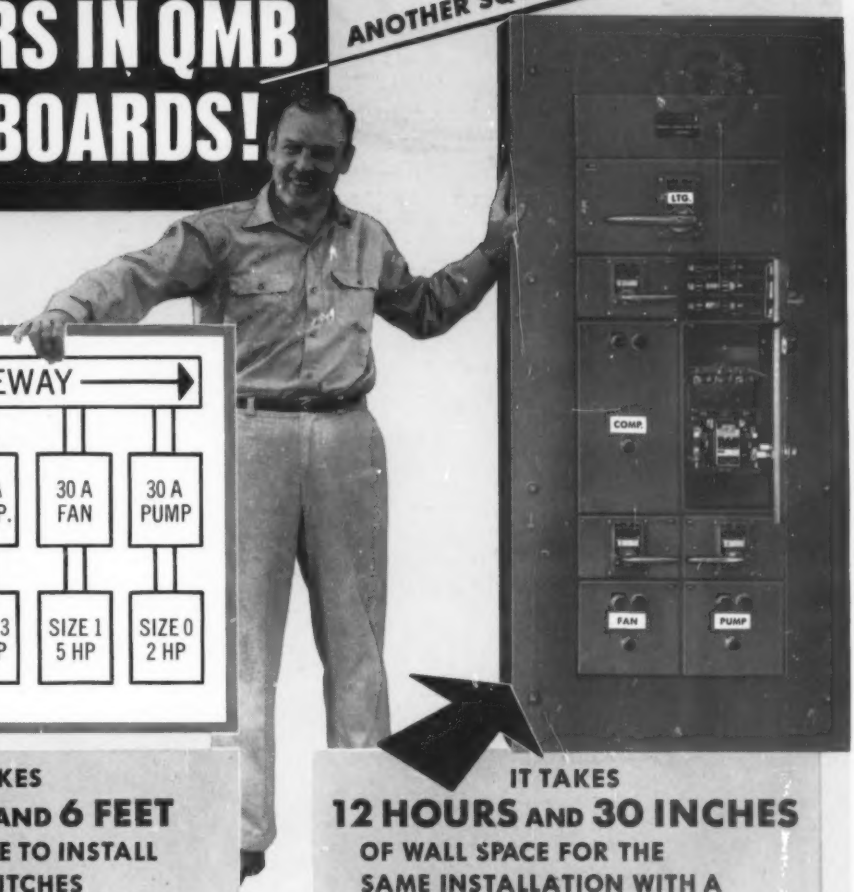
STARTERS IN QMB PANELBOARDS!

ANOTHER SQUARE D FIRST!

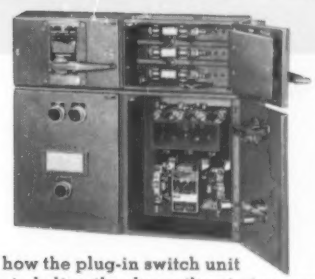




IT TAKES
41 HOURS AND 6 FEET
OF WALL SPACE TO INSTALL AND WIRE SWITCHES AND STARTERS LIKE THIS

IT TAKES
12 HOURS AND 30 INCHES
OF WALL SPACE FOR THE SAME INSTALLATION WITH A QMB STARTER PANELBOARD

Why mount separate starters and disconnect switches? It costs extra money. It wastes space. It takes a lot more time. QMB Starter Panelboards give you a *safer* installation because you can't open a starter when the switch is ON. They give you a much *better looking* job. Since they can even be *flush* mounted, they offer a lot more installation *flexibility*. QMB panelboards accommodate reversing and non-reversing starters, sizes 0 through 3. QMB switchboards and unit substations handle sizes 0 through 5. All of them are available, factory-assembled and wired. Or get enclosures, starters and plug-in switch units from your Square D distributor for on-the-job assembly.



Notice how the plug-in switch unit is mounted directly above the starter, permitting interlocking. The starter cannot be opened when the switch is in the "ON" position.

It's easy to order these starter and switch units. See Page 57 in your Square D Digest and order from your distributor.

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY

ARCHITECTS AND ENGINEERS: *Norman F. Six and Elliot C. Fletcher, Tampa and Schmidt, Garden and Erikson, Chicago*

CONTRACTOR: *Miller Electric Co., Jacksonville, Fla.*

Electrical Protection is MODERNIZED with BUSS Fuses

in the TAMPA CITY HOSPITAL, Tampa, Florida

In this beautiful hospital, tremendous in size, it was found necessary to increase the capacity of the electrical system to meet today's requirements. Modernization of the electrical system resulted in estimated available fault currents of 150,000 amperes.

With faults of this magnitude possible, it became essential that a superior type of protective device be used.

So in the main switch board are BUSS Hi-Cap fuses and FUSETRON dual-element fuses, both applied to give the interrupting capacity and dependability needed on the circuits they protect. (Installation includes 6-2500 amp., 3-2000 amp., 12-1200 amp., 9-800 amp. BUSS Hi-Cap fuses . . . . and 3-600 amp., 9-400., 27-200 amp. FUSETRON fuses.)

MAXIMUM SAFETY

The interrupting rating of BUSS Hi-Cap fuses is 200,000 rms symmetrical—and for FUSETRON fuses it is 100,000 rms symmetrical.

LIFETIME DEPENDABILITY

Unlike mechanically operated devices, a fuse has no hinges, pivots or contacts to stick or get out of order.

Whether you are modernizing an electrical system or installing a new one—the high interrupting capacity, life-time dependability and maintenance-free features make Buss Hi-Cap and FUSETRON fuses deserving of your special consideration.

for more information

On BUSS Hi-Cap fuses . . . write for bulletin HCS

On FUSETRON dual-element fuses . . . write for bulletin FIS

BUSSMANN MFG. DIVISION, *McGraw-Edison Co.* ST. LOUIS 7, MO.